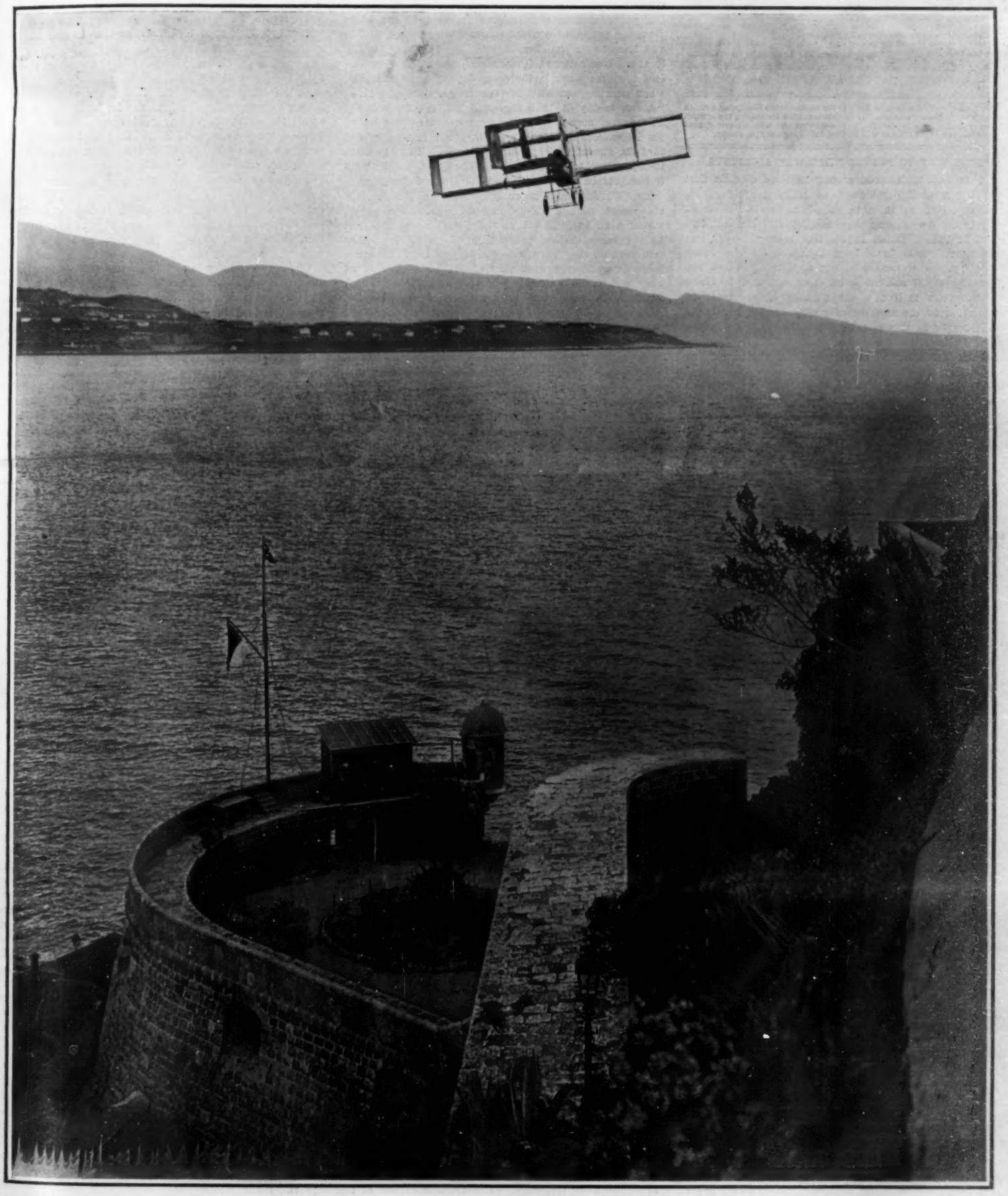
SCIENTIFIC AMERICAN

[Entered at the Post Office of New York, N. Y., as Second Class Matter. Copyright, 1910, by Munn & Co., Inc.]

A POPULAR ILLUSTRATED WEEKLY OF THE WORLD'S PROGRESS

Vol. CII. No. 17. ESTABLISHED 1845.] NEW YORK, APRIL 23, 1910. [10 CENTS A COPY. $3.00 A YEAR.



ROUGIER FLYING ACROSS THE BAY OF MONACO IN HIS VOISIN BIPLANE.—[See page 342.]

SCIENTIFIC AMERICAN

ESTABLISHED 1845

MUNN & CO., Inc., - Editors and Proprietors

Published Weekly at
No. 361 Broadway, New York

CHARLES ALLEN MUNN, *President*
361 Broadway, New York.
FREDERICK CONVERSE BEACH, *Sec'y and Treas.*
361 Broadway, New York.

TERMS TO SUBSCRIBERS.

Subscription one year..... $3.00
Postage prepaid in United States and possessions Mexico, Cuba and Panama.
Postage to Foreign countries..... $1.50 per year extra.
Canadian postage..... .75 per year extra.

THE SCIENTIFIC AMERICAN PUBLICATIONS.

Scientific American (established 1845)..... $3.00 a year
Scientific American Supplement (established 1876)..... 5.00 "
American Homes and Gardens..... 3.00 "

The combined subscription rates and rates to foreign countries, including Canada, will be furnished upon application.
Remit by postal or express money order, or by bank draft or check.
MUNN & CO., Inc., 361 Broadway, New York.

NEW YORK, SATURDAY, APRIL 23rd, 1910.

The Editor is always glad to receive for examination illustrated articles on subjects of timely interest. If the photographs are *sharp*, the articles *short*, and the facts *authentic*, the contributions will receive special attention. Accepted articles will be paid for at regular space rates.

TRUE WAY TO PREVENT RAILWAY ACCIDENTS.

IT is well understood among railroad officials that the most fruitful cause of railroad accidents in this country is to be found in the lax sense of discipline among the employees. Presumptive proof of this is found in the fact that, although our leading railroads have been equipped with a block signal system and other safety appliances, which are generally equal and in some cases superior to those on European railroads, the number of accidents in proportion to the number of people carried continues to be larger in this country. We therefore note with much satisfaction that the Chicago and Northwestern Railway has taken a step in the right direction by appointing an official whose chief duties will be to make a study of railway accidents, and by a system of education and strict enforcement of discipline, endeavor to eliminate the most fruitful cause of injuries to passengers and damages to freight. Opportunity was recently taken of the reorganization of the company's claim department, to relieve the claim agent of much of the detail of his work, and allow him to make a careful study of the causes of all accidents in the handling of passengers and freight. It will be his duty to bring about a more thorough co-operation and a higher state of discipline among the various employees, upon whose fulfillment of their duties the safe operation of the trains immediately depends. The scheme is a most excellent one, and we believe that its results will be so satisfactory as to lead to similar arrangements on at least the more important railroads of the country.

AN EPOCH-MAKING EXPERIMENT.

AT the last meeting of the Institution of Naval Architects, a paper was read by the Hon. C. A. Parsons which created a profound impression among the British naval architects and shipbuilders. It was described by Prof. J. A. Ewing, of Cambridge University, as "epoch-making"; and the announcements which it contained must be considered as second only in importance to those which were made by Mr. Parsons after the successful trial of his first turbine-driven steamer, "Turbinia."

Mr. Parsons's paper, which was entitled "The Application of the Marine Steam Turbine and Mechanical Gearing to Merchant Ships," described the successful application of a combined steam turbine and reduction gear to a slow-speed merchant steamer, the "Vespasian." The "Vespasian" is a small cargo steamer of less than a thousand tons displacement, which, in her original condition, was driven by reciprocating engines which were sufficiently up-to-date to be considered as representative of the average engine-room equipment of the modern tramp steamer. To make certain that the comparison would be trustworthy, and equally favorable both to the reciprocating and the turbine engine, the reciprocating engines were thoroughly overhauled and put in first-class condition. The ship was then taken to sea and put through a course of trials, in which complete data relating to draft, weather, water and coal consumption, etc., were collected. The vessel was then returned to the yard, the reciprocating engines were removed, and a fast-running steam turbine, with a 1-to 40 reduction gear, was installed, the propeller used with the reciprocating engine being left untouched. The reduction gear consisted of pinions on the high-pressure and low-pressure turbine shafts, and a large spur wheel on the propeller shaft. The gears were of cast iron, and the whole was mounted in plain bearings without the use of any special adjustment devices. The "Vespasian" was then taken to sea, and put through a similar course of trials to those which were run with the reciprocating engines. Except for the substitution of turbines for reciprocating engines, the ship with respect to draft, boilers, and propeller was in exactly the same condition as in the first trials.

When the results came to be worked up, it was found that with seventy revolutions of the propeller, there was a net gain of from 15 to 16 per cent when steam for all purposes was considered, and of from 18 to 19 per cent for the propelling engines alone. Translated into terms of boiler power, this means that one boiler out of every six in the slow cargo boat can be dispensed with.

Speaking of the important question of the strength of the mechanical gearing, Mr. Parsons stated that as the "Vespasian" had been taken out in a heavy sea without experiencing any trouble with the reduction gear, it was probable that the gear would stand anything that the shaft would stand. In the discussion of the paper various shipbuilders referred to the long-standing prejudice against mechanical gearing; and it was the general opinion that its rapid wear was due to the imperfections of manufacture which characterized machine work in the early days of the steamship, when gearing was used for speeding up the propeller, just as to-day it is being used for speeding down. The early mechanical gearing, moreover, because of its imperfection, was very noisy; but it was agreed that the almost perfect gear cutting which can be done to-day will practically eliminate the noise, particularly if the gear be suitably inclosed and sound-deadened.

Mr. Westinghouse recently proved, in the remarkable tests with a 6,000-horse-power reduction gear, which were carried out at the Pittsburg shops, that by the use of helical gearing, which is the type that was used on the "Vespasian," it is possible to transmit large horse-powers with an inappreciable amount of wear and with an efficiency of over 98 per cent, which is about the same efficiency as was secured by Mr. Parsons.

Now the vast importance of these "Vespasian" trials will be appreciated, when we bear in mind that about two-thirds of the steam merchant marine of the world is of the slow, cargo-carrying type, for which the steam turbine, because of its high speed of revolution, has been found to be unsuitable. Moreover, the "Vespasian" was the first vessel to be fitted with the new system; and it is reasonable to conclude that with its further application to cargo steamers, an average economy of at least 20 per cent will be guaranteed on the engine and 17 per cent on engine and auxiliaries, or as Prof. Ewing put it, there will be a saving of one boiler in six on the whole equipment.

Furthermore, not only will there be economy at the coal pile, but the reduction in weights will make possible a considerable increase in the cargo-carrying capacity. In this connection, it should be noted that the United States Navy Department has authorized the installation of Westinghouse turbines with Melville and McAlpine gears in the new fleet collier No. 8, which is being built at Sparrows Point, Maryland. The space and weight saved by the use of this apparatus, as compared with the reciprocating engines originally contemplated for this vessel, will enable it to carry about 200 tons more coal; and it is believed that the economy in coal consumption will be such that the saving thereby effected will add another 200 tons to the net carrying capacity of the collier.

WATERWAY DEVELOPMENT IN EUROPE AND THE UNITED STATES.

WE note that a contemporary sounds a word of warning against precipitate action in the wholesale development of the waterways of the United States, by drawing attention to a document issued by the British Royal Commission on canals and waterways, which it considers to be worthy of serious study on this side of the Atlantic. The report deals with the waterways of Belgium, France, Germany, and Holland; and our contemporary advises that it be studied in connection with the recent report of the army engineers on the proposed 14-foot waterway from the Lakes to the Gulf. It is claimed that the Royal Commission report strongly sustains the contention of the army engineers, that the Mississippi and its tributaries, with 14,000 miles of navigable waters, as developed and maintained by the government, furnish as good an inland waterway system as any in Europe.

In France the waterways that are used considerably include a total of about 7,500 miles of rivers and canals, and of this 1,306 miles of rivers and 1,671 miles of canals have been deepened to a minimum depth of 6.6 and to a maximum depth of 8.5 feet, the bulk of the traffic being carried on water varying from 5 feet in depth down to 1.5 feet.

In Germany there are 8,500 miles of waterways, the depth of which in the rivers varies from 3 to 6 feet, while on the lower sections of the larger rivers the depth becomes from 8 to 10 feet. The depths of the canalized rivers are from 2.6 to 7.5 feet, and of the canals from 4 to 10 feet, from 4 to 6 feet being the most common. Comparing these figures with those of the Mississippi, we find that, even in the low-water season, boats of 25 to 30 feet draft may be sent from the Gulf of Mexico 270 miles to New Orleans, Baton Rouge, and Bayou Sara. Boats of 9-foot draft may travel 840 miles farther to Cairo; those of 8-foot draft may pass from Cairo 182 miles to St. Louis; while those drawing 4½ feet may pass up the Mississippi, Illinois River, and Illinois State canals, a further distance of 365 miles to Chicago. The Ohio has a depth of 9 feet from Cairo to Pittsburg, a distance of 1,000 miles.

Now, since the Mississippi and its tributaries actually constitute a better waterway system than any in Europe, the question is asked, Why is the river and canal traffic in Europe growing faster than the railroad traffic, while in the United States railroad traffic is rapidly increasing, and river and canal traffic falling off? One important reason is that both the municipal and private interests in Europe have provided the waterways with good terminals, and boats and barges have been developed which are specially adapted to river and canal traffic. Here, practically nothing of the kind has been done.

As an offset to these conditions, the advocates of larger waterway development are in favor of the construction of much deeper waterways than any in Europe, deep enough to allow lake and ocean-going vessels to pass through. When the government investigated this subject for the State of New York, the conclusion was reached that the cost of transporting grain by the typical lake freighter on a deep-water canal would be 38 per cent greater than by a towboat and barges on a barge canal; and it was this conclusion that led the State of New York to abandon the idea of a 20-foot canal.

Our contemporary is of the opinion that it would be the very height of folly for the government of the United States, under present transportation and commercial conditions, to spend hundreds of millions on the development of inland waterways, believing that the only way by which considerable commerce could be diverted to the present or proposed waterways would be to compel the competing railroads to raise their existing rates on low-grade commodities and refrain from making reductions. In France the government compels the railways to keep their rates at least 20 per cent higher than the rates on the competing waterways; this practice, according to the report of the Royal Commission, being based on the opinion that waterways, because of the longer duration of transport, are not able to compete at equal rates with the railroads.

OSMOTIC PRESSURE AND CURRENTS.

IT is known that a current can be generated by forcing a liquid through a porous diaphragm or filter, but such currents were too small to be of practical value. The matter has been taken up by a German scientist, B. Schwerin. He claims to have obtained remarkable results in current production. A liquid circulates in a tube of large diameter and at a high pressure. Inside the tube is placed a filter through which the liquid passes, consisting of a certain thickness of a porous substance contained between two sheets of wire gauze. The current is taken from each of the sheets by a wire. To produce a current we must have the proper liquid and the filter must be specially made. Adding suitable salts to water we find a high value for the current. At the same time the diaphragm must be made of matter in an impalpable powder to be effective, so as to reduce the size of the pores. As an example, he uses a pressure of 5 atmospheres for the liquid, and a layer of finely powdered carbon ½ inch thick with a surface of 32 square inches, the internal resistance being 1,000 ohms when distilled water is used. But a small current is now produced, but when we add ammonia to the water the current is increased ten times and the electromotive force twice, therefore we have 20 times the energy by using ammonia. The best results are given by fine quartz powder and the use of a much higher pressure. At 80 atmospheres we have as high as 32 volts and 0.8 ampere, or 2.6 watts, which is a very good result. The energy seems to vary as the square of the pressure, and at higher pressures we could obtain large currents. When the pores are finer the flow is lessened, but the energy is about the same. The liquid is best sent in a closed circuit of piping.

HALLEY'S COMET.

THE first observations of the comet in the morning sky show that it is disappointingly faint. Its intrinsic light has evidently not increased as rapidly as in the case of some other comets. Unless there is a change in this respect, it will be far from conspicuous to the naked eye until the latter part of May, and those who wish to see it in the morning sky will do well to use field glasses, and to look for a much fainter object, with far less of a tail, than our front page illustration of last week showed.

ENGINEERING.

The Pennsylvania Railroad last week operated the first electric train through the tunnels under Manhattan Island and the East River. The train, made up of six construction cars and an electric locomotive, ran from the station in New York to the Thompson Avenue viaduct in Sunnyside yard, Long Island City.

An important link in the proposed waterway from the Lakes to the Gulf must be eliminated from consideration of that scheme, at least for the present. The section referred to is known as the Illinois River Deep Waterway, for which it was proposed that the State should spend $20,000,000, in the extension of the Chicago drainage canal down the valley of the Illinois River. The bills proposing to proceed with the construction were defeated in a special session of the Illinois Legislature, which adjourned last month.

The city of Seattle is doing some exceptionally heavy grading in the reduction of the steeper hills in that city. This grading, which has always been going on intermittently, has recently been undertaken on an ambitious scale, and under the present scheme over fourteen million cubic yards have been removed. When the plan is completed, the total will have reached thirty-four million cubic yards. The work is being done by the hydraulic sluicing method, and the present project covers an area of forty-three city blocks.

The Great Western Railway in England is installing a compact railway ticket printing machine. When a ticket for a certain station is required, the clerk touches an indicator which carries the name of the station, slips a blank into a slot, turns a handle, and the completed ticket drops out. At the same time a record of the sale is printed on a continuous strip of paper, together with the fare and all information required for bookkeeeping. When the clerk goes off duty, he simply has to total up the continuous strip of paper and count his cash.

It is well understood among naval men that the speed of a vessel is affected by the depth of the water, not merely in shoal places, but in the deeper waterways. With a view to determining what effect different depths of water have on speed, the Board of Inspection and Survey has arranged that the standardization trials of three vessels shall be made over three different courses. The battleship "Michigan" and the destroyers "Reid" and "Flusser" will have their trials over three measured mile courses, one at Rockland, Maine, another at Cape Cod, and the third in Delaware Bay.

The Mallet articulated compound locomotive continues to grow in favor; the reports from locomotives of this type which have been some time in service being in general very favorable. The New York Central system has recently put its first Mallet compound in service on the Boston & Albany line. The present class of heavy freight engine on that road has a maximum tractive power of 26 tons; whereas the Mallet, when working compound, has 33 tons, and when working simply 40 tons tractive power. The success of this type in freight service is undisputed. What results it will give in fast passenger service time will tell. The operation of the powerful express Mallet on the Santa Fé road will be watched with great interest.

Advices from Washington state that the chief of the Bureau of Navigation of the Navy, the aid for operations, and the aid for personnel, are mapping out another extended cruise for the Atlantic fleet. At present the scheme proposes a naval review at Hampton Roads, followed by the departure of sixteen ships in four divisions for Gibraltar, where the divisions will separate and visit the leading ports on the Mediterranean. It is possible, though not decided, that the fleet will proceed thence through the Suez Canal to the Philippines and San Francisco, returning home by the Straits of Magellan. The fleet will include the four new dreadnoughts, "Delaware," "North Dakota," "Michigan," and "South Carolina," and the "New Hampshire," "Mississippi," and "Idaho," seven of our latest battleships, which were not present on the former cruise.

We are indebted to Mr. Frank S. Taylor for the description of the new dam with which it is proposed to replace the wrecked structure across the Colorado River, which was carried away at Austin, Texas. The dam, which will be constructed of reinforced concrete, will rise 65 feet above low water and extend for 1,096 feet in length. The portion of the old dam which was not carried away will be incorporated in the new structure. It will be supplemented by a reinforced concrete addition, which will raise its crest eleven feet higher than the old dam. To prevent the recurrence of the seepage through the fissured rock, which was so disastrous to the old structure, curtain walls two feet thick are carried down thirty feet below water, and at the bottom of the trenches holes are drilled five feet apart to a depth of thirty-five feet, into which liquid cement grout will be pumped at a pressure of 150 pounds per square inch, thus filling the crevices.

ELECTRICITY.

Russia is becoming interested in hydro-electric power plants, and is examining into the matter of electrifying suburban divisions of its State railroads. An investigation is being made of our high-tension transmssion systems, and it is probable that a new field will be opened for American engineers.

An electric lighting plant in Nebraska is manufacturing ice as a by-product. The exhaust steam of the plant, which would otherwise go to waste, is utilized in the ammonia absorption process of ice manufacture, and also for distilling water from which the ice is made. This venture, we are informed, has proved a very profitable one for the lighting company, and might be copied to advantage by other plants similarly situated.

A new system of treating eggs so as to prevent them from growing stale when in cold storage, has been discovered in Rochester. This consists in subjecting the eggs to an electrical current. The theory is that eggs when placed in storage are alive and are gradually frozen to death, whereas if the life is destroyed by an electrical current before they are placed in storage they do not taste stale, even when kept on ice for a long period of time.

In an address recently made by Prof. John W. Whitehead of Johns Hopkins University, it was pointed out that out of the 220,000 miles of railroad in this country, only a thousand miles have as yet been electrified. He called attention to the fact that the electrification of the elevated railroads in New York resulted in increasing the capacity of the roads fifty per cent. To be sure, the questions of electrifying suburban, express, and freight service require separate consideration, but Prof. Whitehead shows that in each case electrification is possible and often preferable.

Tungsten filaments are commonly made by mixing the metal in a paste that is then extruded in the form of a filament, after which the paste is expelled and the particles of metal are welded together by an electric current. This complicated method of forming the filaments is due to the fact that tungsten is not sufficiently ductile to be drawn out into fine filaments. An English concern has just discovered a method of producing drawn filaments of tungsten, and the General Electric Company has also just announced the discovery of a method by which tungsten may be rendered sufficiently ductile to permit of its being drawn into fine wires. The drawn tungsten filament is stronger than the filament made by the "sintering" process.

The Junior Wireless Club is making a strong protest against bills that are now before Congress aiming to restrict amateur work in wireless telegraphy. Particularly objectionable to them is the proposed annual fee of $100, to be exacted from all wireless stations. As there are between 40,000 and 50,000 boys in the country with their own wireless equipments, this virtually represents a tax of between four and five million dollars. Of course, very few boys could pay a $100 fee, and the result would be that practically all amateurs would be eliminated from wireless experimentation. It does not seem as though this would be advisable, because many of the improvements in wireless telegraphy have been the work of amateurs.

Explosions are often caused in flour mills and breweries by nails or other iron particles that find their way in the grain, and which when they strike the steel rolls of the mills produce sparks and ignite the finely pulverized material about them. Recently a large malting concern that had been troubled by many such explosions installed a set of electro-magnets over which the grain is passed before being prepared for shipment to the breweries. All iron particles in the grain are thus picked up by the magnets and 800 to 1,000 bushels of grain are cleaned per hour. When the magnets have collected a large amount of metal, they are swung to one side, de-energized, and swept clean of any particles adhering to them by residual magnetism. Since the installation of these magnets, there have been no explosions in the mills.

A series of tests was recently conducted for the Board of Education of Newark to determine the best form of lighting for schoolrooms. The rooms in which the experiments were tried measured 22 by 34 feet and were 12 feet high. Three systems were tried, consisting of twenty-two 16-candle-power lamps, five 75-candle-power graphitized filament lamps, and five 100-watt tungsten lamps with glass reflectors and frosted tips. The tungsten lamps were the most economical and gave by far the best light at each desk, as was determined by illuminometer readings. A similar investigation has been made in Boston, where it was suggested that the room be lighted by lamps placed along the side walls just under the ceiling in boxes with prismatic glass bottoms, which would cast the rays into the room at the desired angle.

SCIENCE.

According to the Journal Soc. Chem., it has been shown that small quantities of bismuth exert little or no influence on the chemical relation of copper and nitric acid.

At a recent meeting of the Royal Society of Medicine in London, a warning was sounded against the reckless use of radium. Even the reputed favorable effects of radium in the treatment of cancer were sharply criticised.

The Seine is the fourth largest river in France, ranking in size below the Loire, the Rhone, and the Garonne. Its drainage basin (30,370 square miles) is larger than that of the Susquehanna (27,400 square miles) or of the Sacramento (27,100 square miles).

Sir John Murray, K.C.B., the well-known naturalist, will head an expedition for biological and physiological exploration in the North Atlantic. Although much has been done in this region, an enormous field is still unexplored. Sir John sailed from Plymouth on the 14th. The sea will be explored to the depth of 1,800 feet.

It is said that Prof. Karl Harries of the University of Kiel has produced a synthetic rubber. The actual details of the process are not before us. Attempts such as these have been made again and again, but with no commercial success. The most that can be said for them is that they indicate the possibility of producing a synthetic rubber from turpentine at some future time.

Dr. Robbins, an English writer, calls attention to the development of the jaws of English boys who were taken out of the streets of London and sent into the British navy. He says: "Undoubtedly the important notable improvement in them, next to their superior stature and healthy appearance, was the total change in the shape and expression of their faces. On analyzing this, one finds that it was to be mainly accounted for by the increased growth and improved angle of the lower jaw." The change is due to the rations of "hard tack" and "salt junk" upon which these lads had subsisted.

Savants from all parts of the world will gather in Pasadena, Cal., next August, and will ascend Mount Wilson. Almost one hundred leading scientists of Europe and America have accepted invitations extended by the Carnegie Solar Observatory to participate in the third regular convention of the international union for co-operation in solar research. Among these will be Prof. Ricco of Mount Etna Observatory, Sicily. Germany, England, and France will send four delegates each. On Mount Wilson are mounted the largest telescopes in the world for the study of the sun, and by August a new one will have been completed. This will be a 150-foot tower telescope, which will have more than double the power of any other instrument of the kind for photographing the sun's rays.

Some years ago several applications of the Thorp plane replica diffraction gratings were exhibited, notably their use with an opera glass for eclipse work. The only disadvantage of these is the necessity of employing glass lenses for collimator and telescope, which not only increase the expense, but render the instrument somewhat limited, in that the ultra-violet region of the spectrum is more or less absorbed. Recent experiments by Mr. C. P. Butler have shown that concave replica gratings can be made to give very satisfactory results; and by slight modifications of the design of mounting, this form of spectroscope may be employed for any investigation for which the ordinary spectroscope is fitted. A valuable feature appears to be that the radius of curvature may be varied within very wide limits, thus providing instruments of different dispersion and light-grasping power.

The orbits of the two inner satellites of Uranus were determined by Newcomb in 1875. At that time no appreciable eccentricity could be certainly proved to exist in either orbit. Osten Bergstrand, of the observatory of Upsala, Sweden, has recently published a discussion of the observations which have been made of these satellites since 1894, chiefly with the great 36-inch equatorial of the Lick Observatory. Bergstrand finds that the orbit of the second satellite, Umbriel, is clearly elliptical and that its apse, or "periuranus," is subject to a secular displacement, from which a flattening of Uranus at the poles may be inferred, and the value of oblateness approximately calculated. No conclusive result in regard to the oblateness of the planet has been obtained by direct observation. Bergstrand deduces from the observations, also, the values of the major axis and eccentricity of the orbit of Umbriel, and that of the mass of Uranus, which he finds equal approximately to 1/23300 the mass of the sun. This value, in combination with Barnard's value of 2.075 seconds for the angular equatorial radius of Uranus, makes the density of the planet 0.16 that of the earth. Bergstrand's values for the mass and density of Uranus are smaller than those which have hitherto been accepted.

THE EROSION OF BRONZE PROPELLERS

ONE EFFECT OF THE HIGH SPEED TURBINE

The introduction of high-speed turbine engines has produced a serious amount of erosion in propellers made of high-tension bronze—a material which until recently showed no serious erosion effects. The trouble which the bronze manufacturer has been chiefly occupied in preventing was corrosion, both chemical and galvanic; but erosion, or the mechanical breaking up of the material by the action of the water, was formerly never considered. One of the most astonishing cases of severe erosion occurred in the case of the Cunard liner "Mauretania"; for after she had been in service about three months, on drydocking the ship it was found that all the bronze propellers were badly eaten away, those at the stern being least affected. The area that suffered most was situated about two feet from the root and toward the after edge of the blade. The corroded area amounted to three or four square feet, and the metal had been eaten away in depths which varied from a quarter of an inch to two and a half inches.

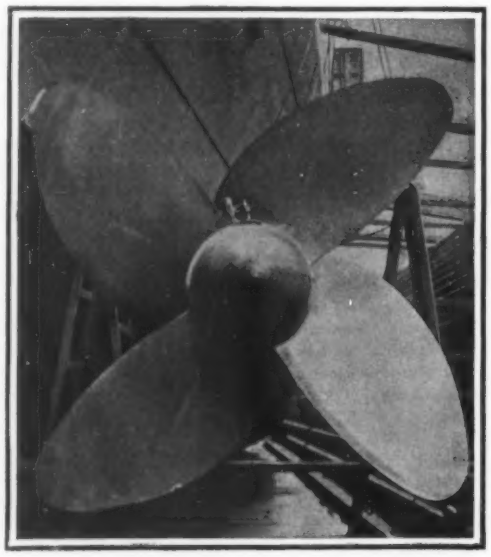
A very thorough examination of the problem was made by Dr. Oswald Silberrad, who, after an exhaustive series of laboratory and other experiments, determined that the deterioration was due to erosion, and found that it could be prevented by the use of a special bronze alloy whose chemical and physical properties were designed specially to meet the condition.

Dr. Silberrad came to the conclusion that since the material withstood the old conditions of propeller service, the primary cause of the deterioration was due to the modified conditions of higher propeller speed, etc. In discussing the new conditions he calls attention, first, to the terrific surface friction of the water. The "Mauretania" was originally fitted with four three-bladed, built-up propellers, of the usual high-tension bronze that has been employed for many years for the propellers of Atlantic liners. They were a little less than 17 feet in diameter, and upon the westward voyage the average revolutions of the engines were 174, the horse-power developed being about 68,000. The perimeter of each propeller traveled through the water in a helical path at a speed of about 105 miles per hour, and transmitted to the water during the whole of the voyage no less than 17,000 horse-power. "The consideration of these figures," says Dr. Silberrad, "enables us to realize that, under such conditions, the water becomes a very rough file for any alloy to withstand; and when the standard bronze, which has proved so serviceable in the past, was subjected to these conditions, we can scarcely be surprised that it failed."

A curious feature in the problem was the wide and marked divergencies in the degree and position of the deterioration in the various propellers examined. Thus in the sister ship "Lusitania," where the conditions were at first apparently identical, the backs of the propellers were quite as much affected as the faces. Moreover, the propellers of certain destroyers showed a maximum damage at the base (see illustration) where the helical velocity is least. In looking for secondary causes, "dirt in the castings" was excluded because the eroded castings proved to be exceptionally free from dirt; "galvanic action" also was shut out by the fact that analysis showed that no large concentration of copper had occurred on the eroded surface. At the same time the areas of maximum deterioration do not coincide with the view that erosion is *alone* the primary cause, since these areas in no case occur at the extreme tips of the blades, where the helical velocity is greatest.

After a prolonged research, involving the examination of a large number of cases of propeller deterioration, it was proved that the trouble was *primarily* erosion, although the degree to which secondary causes entered into the problem varied more widely than was anticipated.

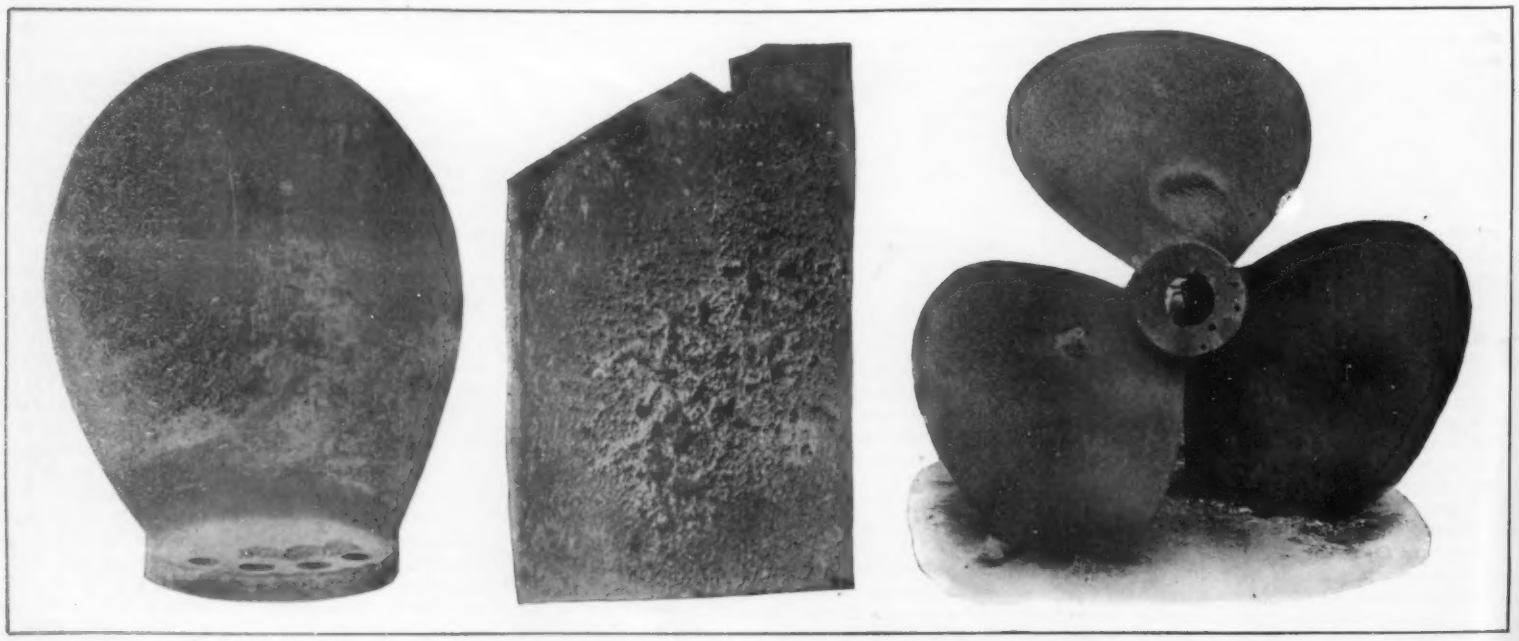
In a series of tests to determine the relative resistance to erosion of a large number of different alloys it was found that the number of hours necessary to produce a certain deterioration varied from 24,700 hours, the time of the regular standard bronze, to 117,200 hours for Parsons new turbine alloy, which was used to cast the new four-bladed, solid propellers with which the "Mauretania" and "Lusitania" have been equipped. An examination of these propellers, each of which weighs about twenty tons, was made after they had been running for nearly six months, by the surveyor for Germanischer Lloyd, who reported that he found them in perfect condition. It is significant, also, that since their adoption for the forward, or wing, shafts each of these ships added about three-quarters of a knot to its previous best speed. As the same four-bladed propellers are to be fitted to the other two astern shafts it is likely that the transatlantic speed may be raised this summer above the 26.06 average at which it now stands.



One of the new solid propellers of the "Mauretania" of special turbine alloy, which fail to show any erosion.

It was in 1850 that Mr. Hind read a paper before the Royal Astronomical Society in which he traced the appearances of Halley's Comet through the ages with the help of the Chinese annals, which had only recently become known in Europe. Although he was sometimes wrong, he was nearly always right. He believed that in the Chinese annals he had found credible references to Halley's Comet back to the year B. C. 11. He regarded it as certain that Halley's Comet reached its perihelion in 1378, and therefore, allowing the normal periodicity, he looked for some mention of it about the year 1301. The Chinese annals definitely describe a great comet in that year. There was one European account of it by Friar Giles which was not reconcilable with the Chinese record. If the Chinese were describing Halley's Comet it seemed that Friar Giles certainly was not. Hind was led to an examination of Giles's credibility. He discovered that his account of another comet in 1264 was so contradictory that he had no hesitation whatever in preferring the Chinese statement for 1301, and concluded that the comet of 1301 was Halley's. He believed that the preceding return of the comet was in 1223, when, in July, shortly before the death of Philip Augustus, a comet was seen for eight days in the evening twilight. The Chinese annals do not mention this comet, but they mention comets in the years 1222 and 1224, neither of which Hind thought closely resembled Halley's Comet. Cowell and Crommelin have shown that Hind was wrong about the particularly bright comet of 1222, which was unquestionably Halley's Comet. Not all of Hind's "ascriptions," as art critics say, are reconcilable with Cowell and Crommelin's latest calculations, but enough is established on all hands to prove that Halley's Comet has been appearing ever since the history of the skies has been written.

A new type of locomotive designed to secure smokeless combustion of bituminous coal has recently been tried on two or three of the railways entering Chicago. The apparatus is designed to operate on the coking principle. The coal is so fed as to admit of the gases being first consumed, the resulting coke being fed to the grates and consumed without the black smoke of more rapid and incomplete combustion. Within the fire-box is a magazine which may be changed in quantity, a ton at a time if desired, from which the coal is automatically fed to the fire. A rotary fan underneath the fire-box affords a supply of fresh air to assist the proper combustion of the gases before they escape through the tubes, and supplies the necessary draught. The arrangement has been used with some success in connection with stationary plants, but there appears to be some skepticism whether the fire thus produced will be of sufficient intensity for locomotive purposes.



Erosion of bronze blade of "Mauretania" after three months' service.

Portion of torpedo-boat destroyer showing severe surface erosion.

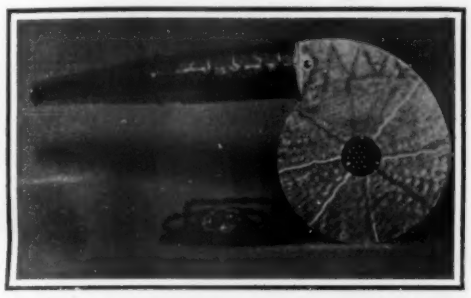
Bronze propeller of a destroyer, showing pronounced erosion about the root section.

THE EROSION OF BRONZE PROPELLERS.

HOT-AIR SHOWER BATHS FOR VETERINARY PURPOSES

BY DR. ALFRED GRADENWITZ

Electric hot-air fans have been employed for some time in medical practice, and have undergone during the last few years most interesting alterations as regards form and use. In their original form they were used for drying hair by means of an air current produced by an electric fan, and heated by an electrical resistance.



THE HOT-AIR VENTILATOR. A SERIES-WOUND ELECTROMOTOR IS HIDDEN IN THE HANDLE.

This current of heated air was soon found to possess striking curative effects. In connection with maladies such as gout, rheumatism, neuralgia, etc., a daily application lasting ten to fifteen minutes would alleviate, and in the case of prolonged treatment, even cure these ailments. It is true that the limbs affected, being especially susceptible to cold after the treatment, had to be carefully protected by warm clothing.

Some time after the new treatment had been introduced in medicine, hot-air currents were found to exert striking curative effects on morbid tissues, and in furunculosis, abscesses, etc., on account of the hyperæmia (abundance of blood) produced by them. Thus, hot-air shower baths have been adopted in an extremely short time, not only in hospitals and sanitoria, but in the consultation rooms of specialists, as well as those of the ordinary practitioner. Their ease of handling, the readiness of the hot-air fans for use in working at a moment's notice, after being connected with an ordinary contact box, and the control of the heat effects at will by a special switch, have greatly facilitated the adoption of the shower baths. In fact, hot-air ventilators are able to generate in half a minute a strong air current up to 212 degrees F., a result impossible with any other apparatus.

The electrometrical instrument factory of Dr. Richard Heilbrun in Berlin has recently extended the use of hot-air shower baths to veterinary practice. The ventilator used in this connection comprises a series-wound electromotor hidden in the handle of the apparatus. The electrical radiator heating the drawn-in air current to a temperature up to 212 degrees is carried by a connection tube 40 millimeters in diameter. The weight of the apparatus is about 2 pounds; the current consumption of the motor under a tension of 220 volts is 0.2 ampere, and that of the radiator 2 amperes. A nickel funnel, 100 millimeters in length and 20 millimeters in diameter, fitted over the mouthpiece allows a hot-air current of increased intensity to be generated, which is particularly valuable in connection with a localized treatment.

As dogs and horses are especially susceptible to

THE HOT-AIR SHOWER BATH AS OPERATED IN LOCALIZED TREATMENT.

catching cold, the hot-air shower bath affords an effective means of alleviating and curing their ailments, even the most nervous dogs becoming accustomed to the unusual treatment after its first application.

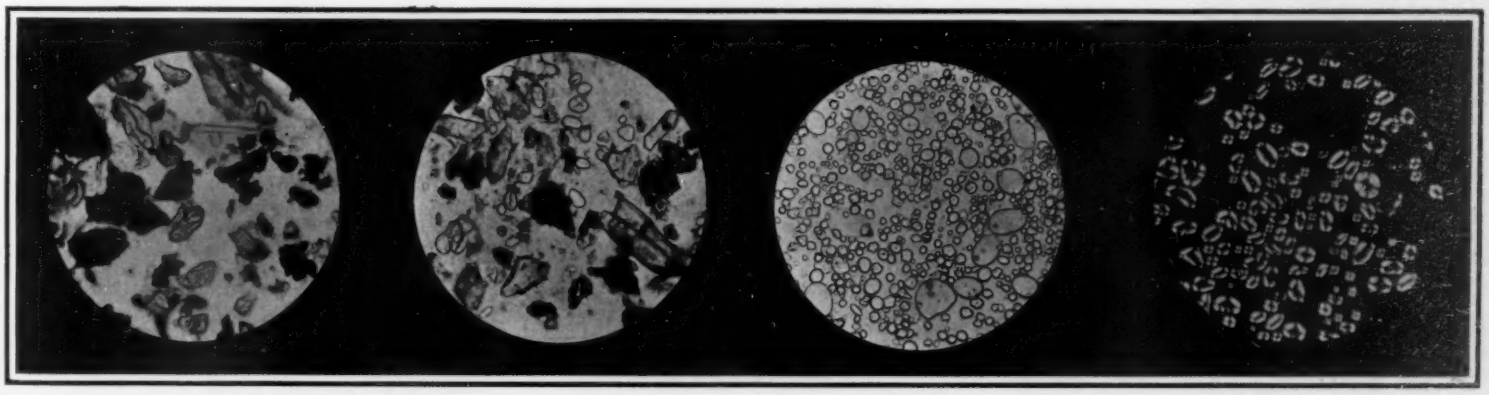
THE MICROSCOPE AS FOOD DETECTIVE

BY P. HARVEY MIDDLETON

Probably no other form of wrongdoing so vitally affects us as tampering with our foods and medicines. Of course, the law allows the presence of a certain percentage of preservatives in foods, but it is the excess of this allowance that causes a continuous war to be waged between the traders and the representatives of the law. And so profitable a proceeding is the importation of inferior material into the food of the American public, that many large firms employ skilled chemists at a high salary in order that their expert knowledge may assist them to drive a coach and four through that most far-reaching and radical law of modern times, the Food and Drugs Act of June 30th, 1906, and fatten on the proceeds.

In what a remarkable manner our food is tampered with may be gleaned from the fact that a large and highly-trained staff of inspectors and their assistants are engaged under the Food and Drugs Act to detect offenses of this kind; and great are the difficulties with which they have to contend. For instance, it is a chemical task to prove that poisonous copper salts are applied to bottled vegetables to give them color, and a microscopic achievement to show that a concoction labeled and sealed as arrowroot is nothing of the kind, but chiefly potato starch. It is difficult to prove who puts brick dust, peroxide of iron, or arrowroot in a harmless-looking packet of cocoa, or which hand introduces substances derived from coal tar into wines, syrups, and drugs to make them more attractive to the eye. One such frequently-used violet coloring matter boasts a name of fifty-five letters which reads diethyldibenzyldiethytriamidotriphenylcarbinoldisulfone.

The alleged olive oil used in salads is often cotton-

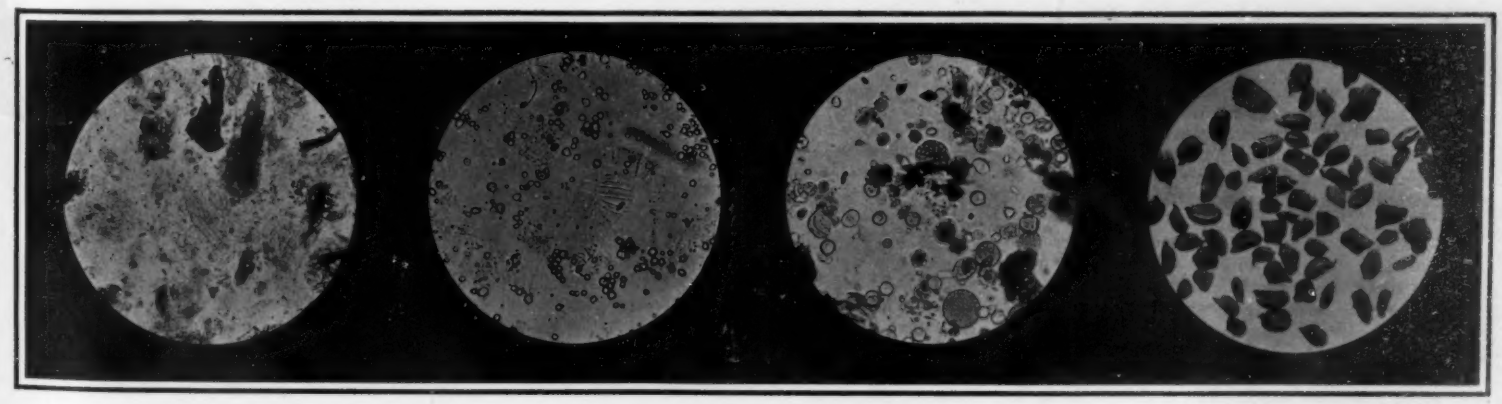


Black pepper adulterated with ground olive pits. The pepper starch has been colored black with iodin, causing the olive cells to appear in contrast.

The angular bodies are pepper starch, and the rounded bodies are bean starch which is used as an adulterant.

The round grains are potato starch, and the angular grains are corn starch, used as an adulterant.

Bean starch photographed with polarized light showing characteristic optical effect.



Chicory, showing some of the characteristic sap vessels by which it is detected when present in coffee.

Cream thickener composed of corn starch (angular bodies) and gum tragacanth (laminated portions).

Pollen from honey. The various forms indicate the different plants visited by the bees.

Celery seed adulterated with ground rock, the latter indentified by its angular form.

THE MICROSCOPE AS FOOD DETECTIVE.

seed oil; and such substances as burnt sugar, Cayenne pepper, acetic ether, tannin, crude cream of tartar, and French plum-juice are frequently imported into brandy and whisky.

The term "adulteration" when applied to food or drugs is broad in its scope, but has been given a well-defined legal meaning. In general it may be said that adulteration consists in injuriously subtracting from a substance any part of its natural or inherent qualities or adding to it any ingredient which would render the article of a different nature than that of its expressed and natural form.

Almost coexistent with the growth of this wonderful country, and seemingly as a part of the fierce business competition which has insidiously developed, this evil of food and drug adulteration has arisen. The conditions of substitution and adulteration of foods and drugs were little short of deplorable less than a decade ago. For seventeen long years the bill which has now become the Pure Food Law lay at the door of Congress, and during all that time it was bitterly opposed by the manufacturers who had so long enjoyed unmolested their privilege of supplying the dinner tables of the nation with impure foods misleadingly labeled.

While this act has done much good, there is still a very considerable amount of adulteration practised. Pepper adulteration is still remarkably common, and "Pure White Clover Honey" is concocted by the imitators of the busy bee from glucose. Other enterprising manufacturers will cause two grains of Cayenne pepper to grow where only one grew before, by making one of the grains grow out of sawdust. Ground peas and beans may be found in black pepper, and celery seed may be adulterated with forty per cent of powdered rock.

In order to run down one class of food faking, the pure-food experts at Washington have introduced the microscope into their work. It can be readily understood how gross adulteration may be detected by a simple microscope, as for instance when foreign seeds, gravel, or powdered rock have been mixed with whole small spices. The adulterant may be of such a character as to escape the notice of the ordinary buyer, though with even a small lens or reading glass the foreign substance may be seen to be very different from the true spice.

The usefulness of the simple magnifier in examining food and drug materials, however, is of little value for the examination of products which are made up of small particles, such as flour, ground spices, and powdered drugs. In such cases recourse must be had to the compound microscope, with a magnifying power ranging from fifty to four hundred diameters.

The world's supply of starch comes for the most part from a limited number of plants; twelve or fifteen include nearly all that are of much commercial importance. To the naked eye these starches all appear as a fine white powder, but under a microscope grains or granules are seen which vary more or less in shape, size, rings, nucleus, and action toward polarized light. Some of the grains are almost spherical, others are angular or ovoid, and still others are very irregular in outline. In diameter they vary from one-tenth to one-thousandth of a millimeter. In no variety are all the starch grains of one size, but usually there are fairly well-defined limits. The way in which they sometimes vary will be seen by reference to the photographs reproduced in this article. Most of the grains show, more or less clearly, fine lines of rings upon the surface. In some varieties these are arranged concentrically, while in others they are eccentric.

"A hilum (nucleus) whose form and position varies widely in certain species commonly occurs in starches," says B. J. Howard, who has charge of this microscopical work in the Bureau of Chemistry at Washington. "In some it is at the center, as in corn and wheat starches, in others near one end, as in potato and arrowroot. When viewed in polarized light, starches show more or less strongly a cross with the bars passing through the hilum. Wheat starch has a central cross, while in maranta it is eccentric and well defined. Bean starch, which illustrates the leguminous type, has a spindle-shaped cross. In the oat a number of starch granules are joined together, forming a mass. When these masses of starch are examined under polarized light, individual grains in the mass have their own individual effect, and interfere so with each other that there results little more than a hazy glow of light."

By becoming familiar with these characteristics, it is possible to identify with considerable accuracy nearly all of the commercial starches. Potato starch adulterated with corn starch, wheat with corn flour, and buckwheat with wheat are examples of those most easily detected. One of our photographs shows a picture of potato starch adulterated with a considerable amount of corn starch. The grains of the latter are easily distinguished by their angular form.

Another interesting application of the microscopic method of food analysis is found in the examination of spices. Many of these naturally vary so widely as to ash, fiber, etc., and in taste that it is impossible to identify certain kinds of adulteration by chemical and physical means alone. A study of the structure of pure samples will usually fit the analyst to detect adulteration in the ground spices as well as to identify the adulterant used. In order to work most intelligently, however, it is imperative that the analyst should have a good foundation in histological botany, since in this class of products the plant cell in its various modifications becomes the means of identification. In an examination of this sort nearly all kinds of plant tissue are to be considered, because some spices are derived from roots, as ginger, some from barks, as cassia and cinnamon, some from flowers, as cloves, some from seeds, as mustard, some from fruits, as red pepper, black pepper, etc., and some, such as sage and thyme, from leaves.

"Unfortunately," says Mr. Howard, "most of the substitutions used for adulteration have a structure very different from the genuine spices. For example, although pepper may be adulterated with ground peas, or beans, it may not always be detected by chemical means, especially when olive pits or pepper shells have been added to counteract excessive starch present in beans. A microscopical examination will reveal such adulteration at once by showing the presence of the large starch grains characteristic of certain legumes. In pepper the starch is present in angular masses made up of small grains."

It sometimes occurs that a manufacturer has added so large an amount of corn meal or foreign ground shells and fruit stones to a pepper as to make the adulteration apparent to the taste by the lack of pungency, which is often corrected by adding a small amount of Cayenne pepper. A sophistication of this kind can be readily detected by the microscopic method of analysis, because the tissues added are so distinctly different from normal pepper tissue. In one of our photographs is shown the microscopic appearance of a sample of pepper which was grossly adulterated with ground olive stones. The starchy material has been stained black in the picture, while the partly clear portions, more or less oblong in form, are the stone cells of the olive pits.

The capsicum fruits are readily identified by means of certain cells found on the inner portion of the pericarp (pod) and others on the seed coats. These cells have characteristic sinuous outlines which make them easy to detect even when present in very small numbers.

In coffee and chocolate preparations roasted chicory, cereals, and peas in the case of the former, and starchy materials and cocoa shells in the case of the latter, are sometimes used for adulteration. Coffee, being the seed of a plant, has a structure which is very different from chicory, which is a root. The cell walls of coffee have a characteristic beaded appearance which is present in but few other seeds. Even after roasting and grinding these beads can be easily distinguished, while chicory contains sap vessels by which it can be detected.

Chocolate and cocoa are made from the seeds of the cocoa plant, to which foreign starches are sometimes added. Cocoa beans contain naturally a considerable amount of starch. The grains are small in size and are easily distinguished from the starchy adulterants, such as corn and wheat flours, or potato, corn, and arrowroot starches. An artificial chocolate coating has been examined which was composed of cocoa shells, corn starch, beef tallow, and some mineral matter, probably used as a coloring substance.

In the production of artificial jellies, jams, and some kinds of confections various thickeners are used, among which might be mentioned gelatin, starch, agar-agar, gum tragacanth, and gum arabic. Some of these are difficult of identification, while others can readily be detected. Agar-agar is a product made from certain seaweeds, and usually contains the siliceous shells of diatoms. These shells are characteristic and quite easily detected in the sediment from the bottom of a dish after the material has been digested with dilute nitric acid. One of our photographs shows such a diatomaceous shell obtained from a sample of artificial "lemon slices" in which was found that the jellying material was agar-agar.

Starch can easily be detected by microchemical and microscopical tests. Gum tragacanth and some other gums of this class contain a certain amount of small starch grains. When allowed to swell in water, a delicate laminated structure is developed by which these gums are disclosed even in such products as ice cream and marmalades.

A sample of thickener for cream composed of corn starch and powdered gum tragacanth is shown herein, and illustrates this feature quite satisfactorily. In this case the corn starch is shown plainly as the angular particles, while the striated bodies near the center of the field are swollen fragments of the gum. The microscope is also of service in the examination of certain edible fats. Thus, if pure lard is dissolved in ether and the latter is allowed to evaporate slowly under proper conditions, crystals of the lard will be formed. These, if normal, will appear under the microscope as narrow plates with chisel-shaped ends. Beef fat treated in a similar manner will normally crystallize out in sheaf-like tufts of crystals, the ends of which are nearly or quite needle-like.

Another application of microscopic analysis is in the identification of the flowers from which honey is made. This is of practical value in the analysis of honeys purporting to be from certain flowers. Although bees will almost invariably gather honey from several kinds of flowers, sometimes one or another of these predominate to such an extent as to impart a distinctive color and taste, enough to allow the honey to be called by that name. By microscopic examination it is readily ascertained whether a so-called apple-blossom honey or an orange-blossom honey is really largely derived from the source claimed. A photograph showing several kinds of pollen found in an ordinary sample of honey is reproduced.

Correspondence.

THE INVENTION OF THE PLAYER-PIANO.

To the Editor of the Scientific American:

I must file a demurrer to an impression created by the illustrated article which appeared in your issue of the 9th inst., under the heading "Ringing Chimes by Perforated Music Sheets." In referring to John McTammany as one of the inventors of the player-piano, I think an erroneous impression is thus conveyed regarding McTammany's true relation to the development of the player.

As a matter of fact, he is known and conceded to be the father of the player by everyone in the piano trade familiar with the player history, and his claims to its inventorship stand unchallenged up to this moment. We do not refer to McCormick as one of the inventors of the reaper or to Howe as one of the inventors of the sewing machine nor to Cristofori as one of the inventors of the piano, although other men besides those mentioned contributed greatly to the development and improvement of the aforesaid inventions.

The history of every great invention has demonstrated that some one man has stood out pre-eminently from all his fellows in the course of its development, and the player has been no exception; and the one man who above all others stands forth pre-eminent in the player field is John McTammany, while around and about him, like so many satellites, have stood other men who have contributed of their genius to develop and improve the invention. In the case of the reaper it was McCormick who overshadowed all his contemporaries; on the other hand, Howe was the presiding genius who led the sewing-machine pioneers, while Cristofori was the pre-eminent genius who first conceived and developed the piano.

It is true that others have improved upon the handwork of McCormick and Howe as well as upon that of Cristofori, but nobody has been able to eliminate the elements which they introduced into their respective inventions; and so long as those essential elements remain in their respective devices, just so long those inventions shall be attributed to the men we have mentioned. But the piano invented by Cristofori was a mute and silent piano, and such it remained from the time it was invented, in 1709, until 1876, when John McTammany breathed within its wooden walls the breath of life, and henceforth it became a living, breathing, yea, almost a human thing, until to-day it stands forth the unsurpassed and unchallenged king of musical instruments. The following definition of the player has been accepted by the piano trade as authoritative:

"Player, a musical instrument consisting of a casing, two actions, and a series of sounding devices within the casing, one of said actions adapted to be operated manually, the other designed to be operated mechanically by means of a perforated sheet on rolls; a wind, spring, or other motor for feeding the sheet and winding the rolls; a bellows and mechanism put in motion by it for actuating the sounding devices of the automatic action, foot pedals or power for driving the motor, and means for controlling the tempo and varying the expression."

Now the first man to embody the foregoing elements in a musical instrument was John McTammany, and it follows that if McCormick is the inventor of the reaper, Howe of the sewing machine, and Cristofori of the piano, by reason of the fact that they were the first to embody in their respective devices the essential elements which distinguished those inventions today, and the elimination of which would make them worthless, then by the same token John McTammany must be regarded as the father of the piano-player mechanism, for no practicable or salable player has yet been made that did not contain the elements first embodied by him in a practical working instrument as early as 1876, and which was publicly exhibited in St. Louis the same year and described by the press of the country at the time, while your own files will show that Munn & Co. applied for a patent on this identical invention on behalf of McTammany on September 7th of the same year, and prior to that nothing in the nature of the present player was known to the Patent Office or the public, either of this country or Europe.

William N. Tyler,
Editor Music Industry.

THE SOLAR AND LUNAR ECLIPSES IN MAY, 1910

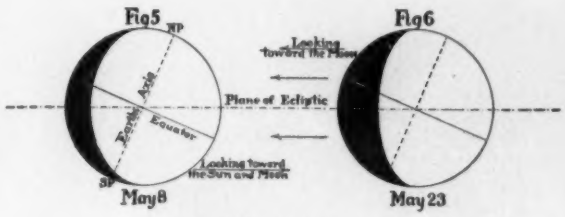
BY FREDERIC R. HONEY, TRINITY COLLEGE

An examination of some of the conditions which govern the moon's motion reveals the great complexity of the lunar problem. While the earth's volume is nearly fifty times the moon's volume, its weight is more than eighty times—the density of the moon being only six-tenths that of the earth. As a consequence, the common center of gravity of the two bodies is within the earth at a distance of over a thousand miles from its surface; and it is this point which moves in an elliptic orbit around the sun. Twice each month the earth and the moon exchange places with reference to the sun. The moon's orbit is an ellipse with the earth at one focus; and the plane of the orbit is inclined at an angle of a little over five degrees to the ecliptic. The eccentricity is one-eighteenth; but the elliptic form is subject to great variations. The moon revolves around the earth at an average velocity of a little over five-eighths of a mile a second; but its path in space is the resultant of its motion in its orbit and of the earth's motion at a velocity of eighteen and five-tenths miles a second; illustrated at Fig. 1. The arrows *A* and *a* represent the velocities of the earth and the moon in their respective orbits. When the moon is at *M*, between the earth and the sun, the direction of the moon's motion is opposite that of the earth. At *M'* the earth and the moon are moving in the same direction. At these points and at any intermediate point *M''* or *M'''* the moon's path is the resultant of the two motions. The plane of the moon's orbit rotates slowly in a direction contrary to her orbital motion; and the perigee has a slow motion in the same direction as that of the moon.

While the conditions which determine the moon's path are complex, observations extending over long periods of time show regularity in the recurrence of eclipses. (See SCIENTIFIC AMERICAN, September 12th, 1908.) The direction of the line of nodes is shown in the plot of the earth's orbit for November, 1909, at the date of the last lunar eclipse; and also in the plot for May, 1910. During the interval this line rotates through an angle of over nine degrees. If the positions of the earth at the dates of the solar and lunar eclipses in May be carefully plotted, and the moon's orbit magnified, the situation of the moon relative to the ecliptic may be determined by an inspection of the plot. The arrow *A* shows the direction of rotation of the orbit; and *a* that of the moon's motion.

At the date of the solar eclipse (May 8.7 d.) the moon's orbit radius is projected on the plane of the ecliptic in the earth's orbit radius; and the moon's position is in that part of the orbit which is below the ecliptic. This is shown more clearly in Fig. 2, in which the orbit is magnified one hundred and sixty times. The moon's position is shown at Greenwich noon from May 1st to the 28th; and also at the dates of the eclipses. On May 8.7 d., the date of the total eclipse of the sun, the moon will be nearer perigee, and approaching the ascending node *N*, which will be reached between the 9th and the 10th. The enlarged plot shows clearly that the moon will be below the ecliptic. Its shadow will therefore be projected on the southern hemisphere. The path of totality will be between latitudes 40 and 70 degrees south; and as a partial eclipse it will be visible in Australia, New Guinea, and Java. On May 23.74 d. the moon will be below the ecliptic, and will pass the descending node *N'* on the same day. The beginning of the eclipse will be visible in portions of Africa, southwest Europe, North America except Alaska, South America, and the southern Pacific Ocean; the ending visible in South America, North America excepting Alaska, and the central and southern Pacific Ocean.

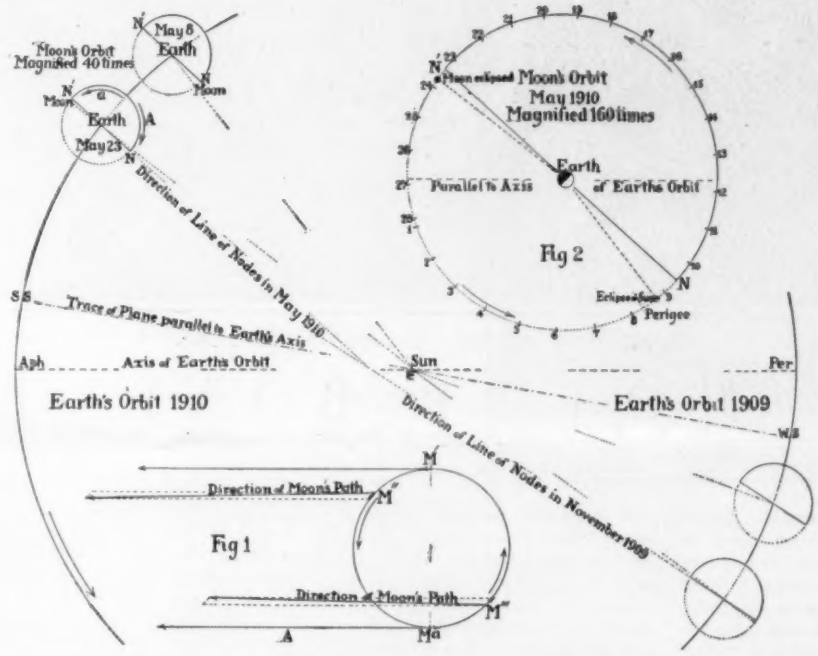
In Figs. 3 and 4 a portion of the earth's orbit in May and the moon's orbit are drawn to the same scale, showing the projection on the plane of the ecliptic of the moon's path in space between the dates of the eclipses. The plot by the larger scale (Fig. 3) shows how points on the curve are obtained between the dates May 8th and 11th, Greenwich noon. The moon's orbit radius is drawn parallel to the position for each date in Fig. 2, and the curve is traced through the positions of the moon. The orbit of the moon at the date of the solar eclipse is also shown. In the



The earth during the May eclipses.

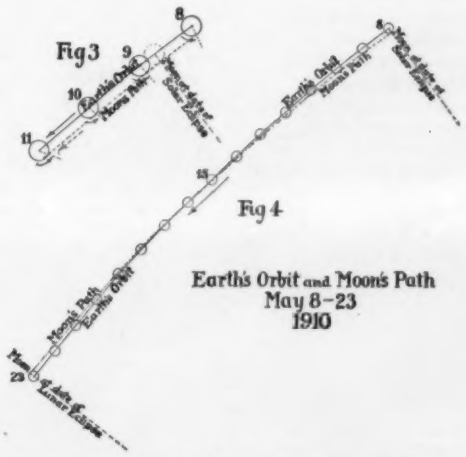
curve of the moon's path (Fig. 4) there is no point of inflection; that is, it is always concave toward the sun. The earth moves about three and one-third times the diameter of the moon's orbit each day.

Figs. 5 and 6 are projections of the earth on a plane



Velocities and motions of earth and moon in their respective orbits. Smaller diagram shows the moon's orbit highly magnified.

which is parallel to its axis, and perpendicular to the plane of the ecliptic. In these projections between the vernal equinox and the summer solstice, more than one-half of the visible surface is illuminated. The



Projection of the moon's path on the plane of the ecliptic.

THE SOLAR AND LUNAR ECLIPSES IN MAY, 1910.

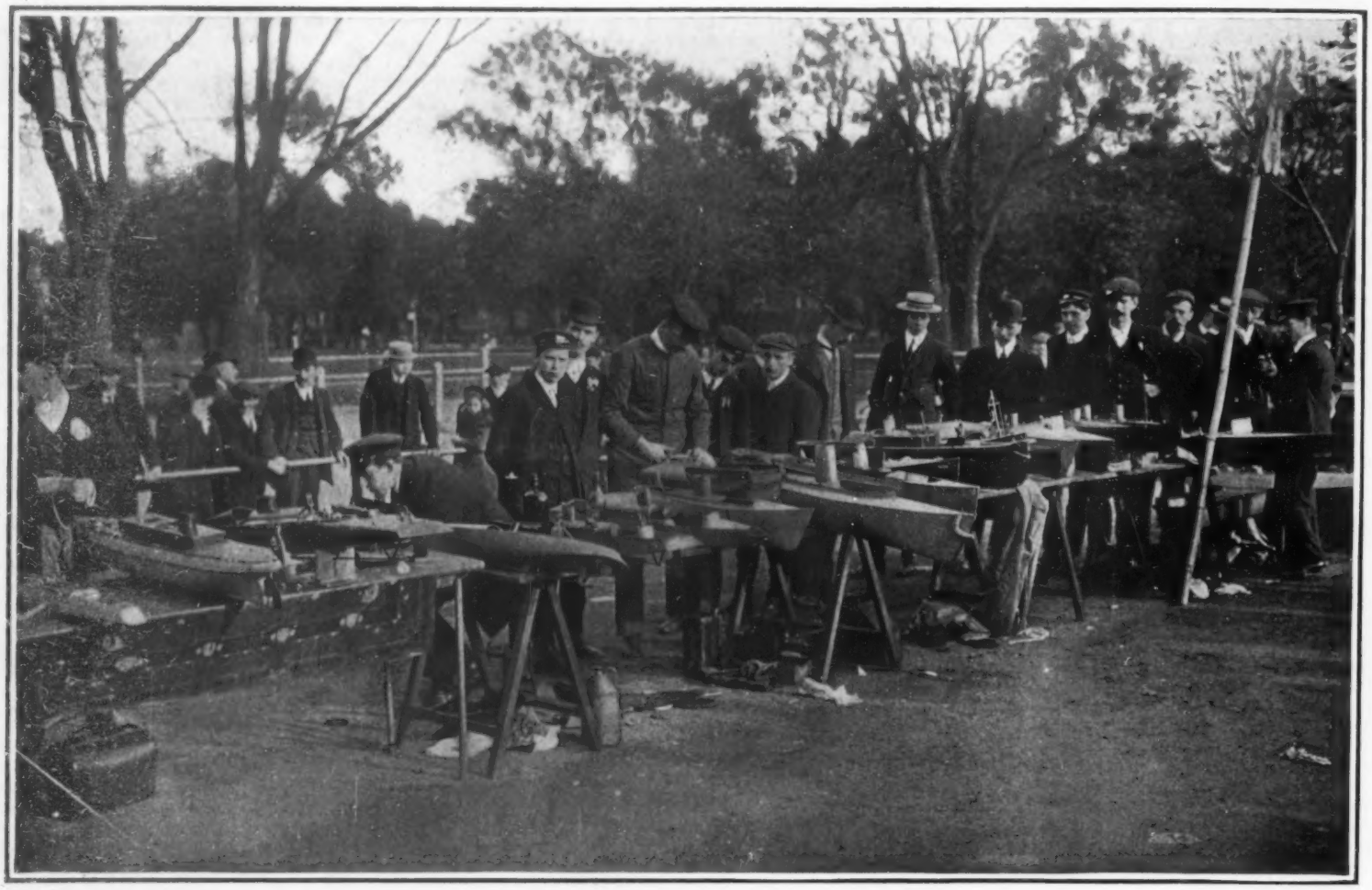
arrows show the directions in which the eclipses will be observed.

The Fast Mail of the Future.

The principle of a mechanical delivery of mail has been established by the highly successful use of the pneumatic tube. This device is not the least conspicuous among the technical installations in the large cities, and probably will be applied to a greatly ramified postal enterprise in the near future. The chief question that arises in consequence is whether a system of delivery similar to that of the pneumatic tube can be installed for greater distances and at the same time afford an enlarged rate of speed. At the present day pneumatic postal delivery is found only in the large cities, and being restricted to local business, asks a rather exorbitant price for such service. It is plain that the employment of such a mode of distribution to distant points, consequently among the cities also, must give a wholly new aspect to the present systems of commercial intercourse. The first attempts made for the development of this idea were those of a company formed in Paris. A recent number of Der Electrotechnische Anzeiger states minutely the technical formation and other progress of this enterprise which has reached the stage of thorough practicality, the result of the quite facile function of the experimental line in use. For the near future the Paris company intends to connect the larger cities of France through electric postal routes that shall not have frequent intermediate stations. The rate of speed proposed is 250 km. (155 miles) an hour. The capacity of the automatic express car is to be 2 cu. m. (2.6 cu. yds.) approximately, and the weight of a load consisting of letters and other postal pieces of smaller dimensions shall not exceed 100 pounds.

The roadbed, so to speak, on which such delivery shall be practised must, of course, be separated definitely from all other avenues of physical communication, must be inaccessible to the public, and this result can be procured only either through an elevated road or through a tunnel. For their experimental road the company has chosen the latter device, and has built a tunnel which contains two rails, one above the other, and of which the cross-section measures 8 sq. m. (9.5 sq. yds.). For the round trip beginning at intermediate stations, branches and switches are provided. The function of the experimental road, procured through an electric circuit, is such that the highest speed is reached very quickly. The cars have two wheels which run on the lower rail and also two rollers which follow the upper rail and hold the cars in position. The cars, moreover, have a middle compartment for mail, and other divisions for the motors and the devices used as brakes. In front and behind the body of the cars is a conical point to diminish the resistance of the air. The frame of the cars is of iron exclusively. The motors are attached to the frame by means of levers which swing around an axis perpendicular to the direction of travel. The current is applied through an upper conduit, and the brakes are worked by compressed air, as well as by the resistance of the air artificially increased by the wings attached to the sides of the front end of the cars. These wings stretch out to catch the air. This device can stop a car within one minute and in a distance of three kilometers after the current is interrupted, but is used only as an accessory to prevent the too rapid destruction of wheels and rails through the exclusive use of the rail-brake, a source of most active friction.

A patent recently granted to Carl Farkas, of New York, describes a method for making incandescent-lamp metallic filaments, which consists in producing on a conducting core a highly refractory coating by decomposing in a vacuum the vapors of a salt of a highly refractory metal in the presence of vapors of pyrogall, with final reduction in a vapor of hydrogen. In detail, the vapors of chloride of chromium and pyrogall are introduced in a vacuum containing the conductor, which serves as a core, which latter is then heated by the passage of a current; the vapors are thereby decomposed, nascent carbon from the pyrogall acting as a cement, chromium probably being formed. When the coating has thus been produced the vapors are removed and hydrogen gas introduced, whereby the deposition is reduced to metal.



Some of the little craft that competed in the racing.

MODEL MOTOR-BOAT RACING

BY H. D. JONES

Model motor-boat racing, a new sport, has caught the popular fancy in England, and is being taken up in all the large cities. With a view to encouraging owners of models to enter their boats in the various competitions, challenge cups are offered by the clubs, and the conditions are made so broad that every designer feels that there is a chance to win a trophy. The prizes are awarded for speed, for workmanship, for the general appearance of the models, for the behavior of the machinery, and the performance of the boats while on the water.

Not less than 5,000 spectators gathered recently at Clapham Common, one of the many open spaces in South London, to witness the regatta on the lake. The competition brought to the front some of the speediest racing models; some particularly fine ones of saloon steamers, liners, and torpedo boats; and other craft that were built for appearance rather than for racing.

The rules of racing were very simple. Each owner started his model boat to run a straight line over the course, at the end of which officials appointed for the purpose waited to "catch" the racers and return them to their owners. After the models were once started no interference was permitted, the ability of the unguided boat to keep in a line for the finish of the course being part of the qualifications for prize winning.

Over a course measuring fifty-one yards, four boats were started in the first race, at which the accompanying pictures were taken. The best time was made by a steam hydroplane, the "Folly," in 9 1-5 seconds; "Sunny Jim," a gasoline craft, did the distance in 12 3-5 seconds; "Leda IV," a steamer, covered it in 15 4-5 seconds, and the fourth steamer, "Idunno," in 21 seconds.

On running off the final heat, boat against boat in pairs, the "Sunny Jim" scored three wins, the "Leda IV" two wins, and the "Idunno" one win, thus taking first, second, and third prizes in the order named. The prizes were silver cups. The "Folly," the fastest boat in the eliminating trials, unfortunately ran off her course in the finals, through her propeller fouling; and not being able to get going in the others, she had to give her opponents a walk-over.

Steering troubles were responsible for many awkward results in the other races. While hailed by the spectators as adding greatly to the enjoyment of the regatta, the failure of the little craft to keep their pointing and the perversity of the machinery when left to its own resources proved sources of great disappointment to the owners of models that failed to keep a true headway. Boats that had run as true as a die on practice spins exhibited a tendency at the regatta to run anything but straight, or not to run at all. Gasoline motors refused to start, pumps gave out, boilers leaked, and the models exhibited a crankiness that showed there is a lot of improvement necessary before this sport can be brought to perfection. But that is why the regattas are encouraged. The weak points of the models are strengthened, and motor-boat building is benefited as the result of the lessons learned from the eccentric performances of the models in the cup races.

The reliability of electric power in model regattas was demonstrated again and again, one finely-modeled liner, the "Fairholme," although not built for speed, scoring through the certainty of her performance and the untrustworthiness of some of her competitors. The surprise of the meeting was the performance of a finely-modeled gasoline boat, the "Silver Dart." So fast was this entry, that the officials stationed to catch the models at the posts could not reach her when a little off the line, and she swerved away. Heading off down the pond, the little boat eluded a second attempt at seizure, and before she finally came to hand she had completed two round trips in brilliant if somewhat erratic fashion, to the admiration of the spectators.

The expediency of running the regattas on a circular instead of a straight course is also engaging the attention of the experts, the difficulty of handling and controlling the big fast boats being very evident. In sending these speedy craft on a straight run across a small pond serious accidents seem unavoidable. One beautiful model, the "Moraima II," after accomplishing several fine sprints, eluded the catchers, dashed off on a course of her own, and wound up a series of mischievous gyrations by running full tilt into the bank, seriously damaging her hull and deranging the machinery. On a large lake, with a round course, such accidents, it is thought, might be avoided by a circle of catchers standing ready to keep the boats on their way until the distance is completed.

The model motor-boat regattas have justified their existence by promoting improvement and bringing unknown designers and inventors of motor-boats and motor-boat machinery to the front. Instead of proving their boats in timid retirement on some out-of-the-way pond, a test that affords no possibility of comparison with the work of other designers, a number of men with kindred ambitions are brought together in these challenge meetings, and the test of the new boat's capabilities is thorough and convincing.

The sport has progressed so far that a national challenge cup is ready for the competing designers and model owners of the United Kingdom, and the various clubs are about to hold a general meeting to draw up rules for the government of the cup regattas. Naval men are especially interested in the exhibitions. At the regatta, which was the subject of the accompanying pictures, Lieutenant William Barrett, R.N., attended with a party of naval cadets and rendered many services to the committee.

Cost of 20,000 Candle-Power Street Lighting Plant.

BY ALTON D. ADAMS.

As tungsten lamps require only 36 per cent as much energy as the carbon type for equal illumination, they have greatly reduced the cost per candle-power of incandescent street lighting.

What can be done with such lighting in a small town is illustrated by the following costs and operating expenses for a plant to generate and distribute tungsten street lamps of 20,000 candle-power total.

Unlike the merely nominal rating of arc lamps, which are a number of times their true candle-power, the tungsten lamps are rated at their actual mean candle-power in horizontal directions.

The capacity of 20,000 candle-power is selected as nearly suited for street lighting in many medium and small towns, according to the density of illumination required. If lamps of 40 candle-power are selected the capacity named amounts to 500, and with lamps of 80 candle-power the 20,000 candle-power capacity will operate 250, the efficiency being the same in either case.

With 500 of the 40-candle lamps spaced 100 feet apart, or 250 of the 80-candle lamps 200 feet apart, 50,000 feet in length of streets may be lighted much better than is usual in small places, while ordinary results may be obtained by spacing the 40-candle lamps 200 feet apart or the 80-candle 400 feet apart from 100,000 feet, or 19 miles, of streets.

In the following estimates of the first cost and operating expenses of a 20,000 candle-power plant, it is assumed that each part of the equipment, from the generators to the poles, is used merely for the purpose of street lighting, so that both the fixed and operating expenses for this lighting are greater than they would

be in connection with commercial service under like conditions.

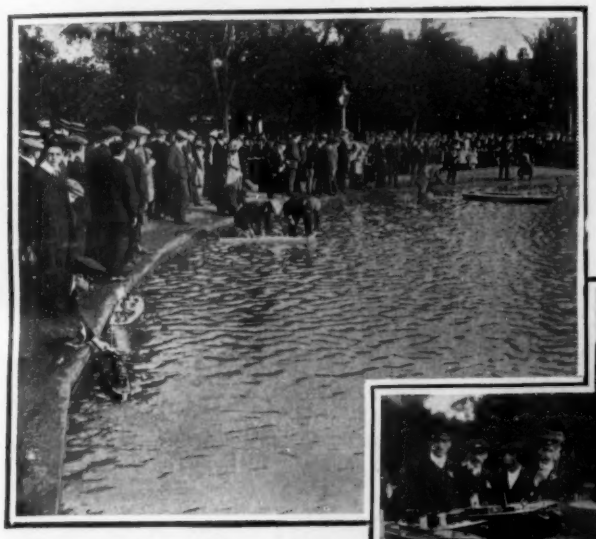
The estimate of first cost covers a suitable plot of land, a station building of brick, concrete and steel, a storage tank to receive petroleum by the carload, a crude-oil engine and accessories, an electric generator with all necessary apparatus and instruments, pole lines on 50,000 feet of streets, circuits on these poles for the distribution of tungsten lamps of 20,000 aggregate candle-power in any desired sizes, and fixtures on the poles for 500 of these lamps, all erected and connected complete and ready to operate.

For this 20,000 candle-power plant as above with 500 lamp fixtures erected the total first cost is $14,200, or 71 cents per candle-power capacity, giving $28.40 per 40-candle lamp. This cost of plant is based on present market prices of materials, labor, and apparatus, and assumes ordinary conditions at the place of erection. In places where prices and freight rates are higher than is usual in the eastern half of the United States an increase of cost would result.

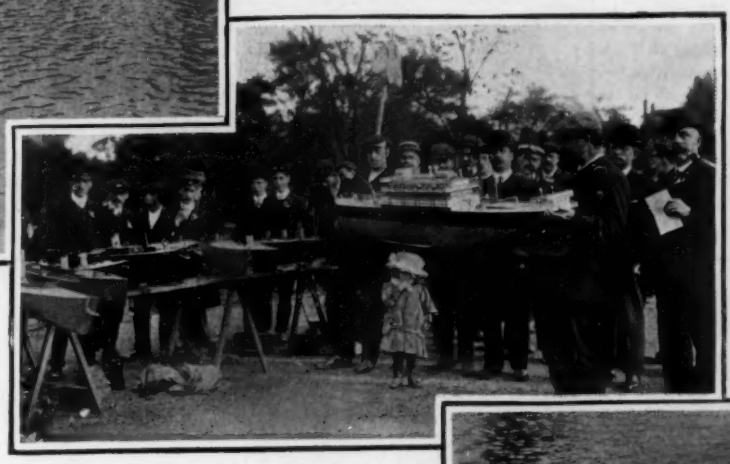
Operating expenses of the above plant will vary with the number of lamps used, even though the total candle-power remains at 20,000, because of the cost of lamp renewals, and also with the hours that the lamps burn yearly.

All night and every night lighting to the extent of 4,000 hours per year is the most desirable, and costs less per hour than lighting on moon and other schedules that run down as low as 1,500 hours yearly. Such all night and every night lighting is gradually displacing the short hour service, and the following estimate of operating expenses is for lamps burning 4,000 hours per annum. With 500 street lamps of 40 candles each making up the total 20,000 candle-power capacity of the above plant and burning 4,000 hours, the annual expense of operation would be $6,200, including $710 for interest on the first cost of $14,200, at 5 per cent. This expense of $6,200 covers all depreciation of the plant as well as the operating expenses that involve an immediate outlay of cash. Apart from the interest charge, the annual expense of operating the 500 lamps of 40 candle-power each during 4,000 hours yearly is thus $5,490. The total expense of $6,200, including interest, amounts to $12.40 yearly for each of the 40-candle lamps burned 4,000 hours, or to 0.31 cent per lamp hour of burning. As each 40-candle tungsten lamp operates with 50 watts, the expense of 0.31 cent per lamp hour, including interest, amounts to 6.2 cents per kilowatt hour consumed in the lamp.

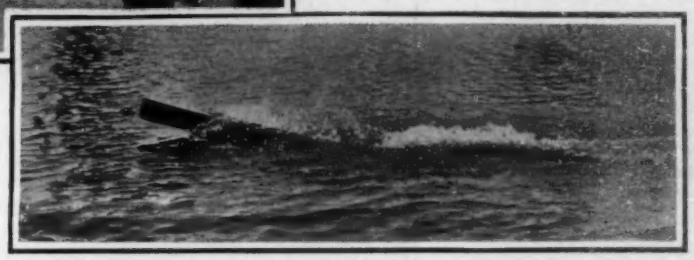
The same conclusion is reached by considering that at the efficiency of 1.25 watts per candle-power the production of 20,000 candle-power requires the delivery of 25,000 watts at the lamps, and this during 4,000 hours amounts to 100,000 kilowatt hours, which into the annual expense of $6,200 gives 6.2 cents as before.



View of the lake, showing the start of a race.



The "Minnehaha" being taken out for her trial.



The "Sunny Jim" makes a great pace.

The Coalinga Oil District, California.

A report on the geology and oil resources of the Coalinga oil district, in the western part of Fresno and Kings counties, California, by Ralph Arnold and Robert Anderson, has just been published by the United States Geological Survey as Bulletin 398.

The district described, which is about 15 miles wide and 50 miles long, stretches along the northeast base of the Diablo Range and includes a band of productive oil land 3 miles wide and 13 miles long at its north end and a narrow strip of oil land along its southwestern boundary.

The region includes about 550 producing wells, which range in depth from 600 to 4,000 feet and penetrate from 20 to 200 feet of oil sand. The product ranges from a black oil of 15 deg. Baumé to a green oil of 35 deg. Baumé. The yield of single wells differs greatly, ranging from 3 to 3,000 barrels a day.

The district is the leading producer in California, and one of the most productive in the world. Its production in 1907 was 8,871,723 barrels, in 1908 it was 10,386,168 barrels, and in 1909 it was probably 15,200,000 barrels or more.

The total quantity of oil thus far taken from the ground in the district to the end of 1909 was about 63,000,000 barrels of 42 gallons each, leaving available a vast store of oil which has been roughly estimated as 2,737,000,000 barrels. Even if this great quantity of oil is in the ground it is not possible to state whether all of it can ever be obtained.

Pipe lines connect the district with the seaboard at Monterey, 110 miles away, with San Francisco Bay, 200 miles away, and with other points.

The report describes the topography, geology, paleontology, and oil in the Coalinga district, which have been in part described in an earlier report published by the Survey but not now obtainable. The present report includes a more complete discussion of the district and many new maps, sections, and other illustrations, besides a paper by Irving C. Allen on the chemical and physical properties of the oils. Many interesting points in connection with the history of the region in past geologic ages are brought out, and by means of careful descriptions of the formations a foundation is laid both for an accurate study of the occurrence of oil within this region and for the tracing of formations and oil horizons in other parts of California.

The report covers 354 pages and includes 52 plates and 9 text figures. The characteristic fossils of the rocks of the region are fully illustrated. These afford a means of identifying particular strata from place to place and of determining the depth and position of the oil-bearing sands. The discussions of the oil zones, of the factors affecting the accumulation and the gravity of the oil, of the relations of oil and water, and of the origin of the oil are of broad general interest. The maps and diagrams and the detailed accounts of the geology of the wells and the character of their various products are of decidedly practical immediate value.

Bulletin 398 may be obtained without cost by applying to the Director of the Survey at Washington.

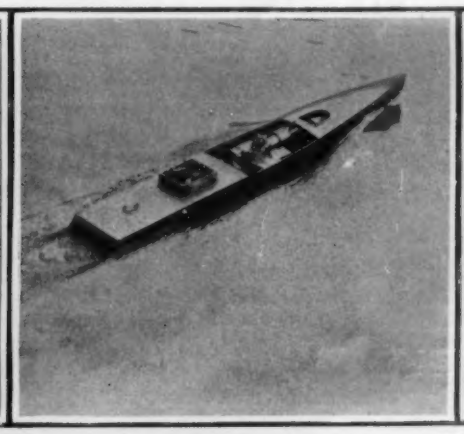
The Current Supplement.

The opening article of the current SUPPLEMENT, No. 1790, deals with electrochemical action and boiler corrosion. There is often much loose thinking and loose talking concerning the stability of ocean-going steamers among those who ought to be better informed than comments made sometimes seem to indicate. The matter is set right in an excellent article entitled "Stability of Ships." Edward Person gives some interesting cam constructions. "Tunnels in Being and Tunnels to Come" is the title of an article which gives much useful information. Richard Thirsk contributes an instructive account of the German army, and shows how wonderful the military system of Germany is. John L. Cowan contributes a good article on "The Story of Silk," accompanied by many excellent photographs.

The newspapers recently published articles on the discovery of what was pronounced to be the greatest radium vein ever discovered in the United States in Leonia, Lincoln County, Montana. Inquiry of the Geological Survey reveals the fact that there is very little, if any, truth in the statements made.

"Moraima," model of a steam ocean liner.

"Fairholme," an electric liner model.



"Belvedere II," a gasoline model.

"Lusus," a gasoline craft. Note the heavy wake.

MODEL MOTOR-BOAT RACING.

ROUGIER'S SPECTACULAR MONACO FLIGHTS

BY THE PARIS CORRESPONDENT OF THE SCIENTIFIC AMERICAN

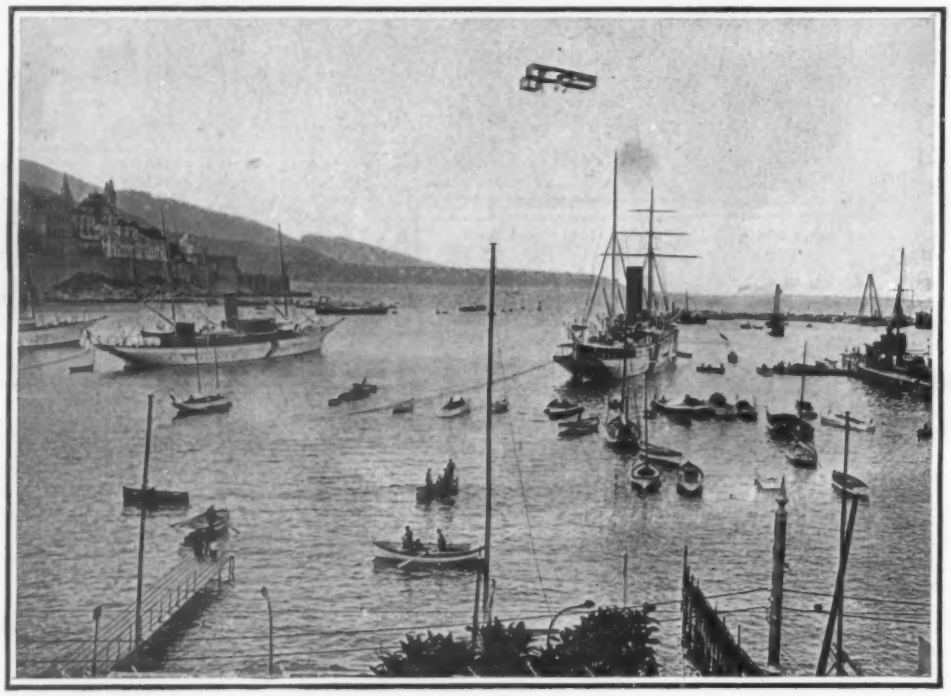
A year ago, despite the offering of substantial prizes for flights across the Bay of Monaco, no aviator made the attempt. This year, however, such big strides have been made in the art of flight that there are probably a score of aviators who are willing to try a flight over water, even without any special arrangements being made for landing in this element in case they are forced to do this.

With the spectacular flights of Paulhan and Charles K. Hamilton over the Pacific Ocean last January as an example, Rougier, a famous French cyclist and automobilist who has lately joined the flying ranks, early last month made some thrilling flights above Monaco Bay, photographs of which we reproduce.

The first flight of an aeroplane over Monaco Bay was made on March 3rd. Starting from the quay, Rougier described a figure eight above the bay and flew over Cape Martin at a height of 250 feet. He landed safely at his starting point after a flight of 4¼ minutes.

Rougier's second flight above the bay was made on the 6th ultimo in the presence of the Prince of Monaco and a large number of spectators. This and the flight the next day were each from 5 to 10 minutes' duration. On the 7th he passed 100 feet above the line of fortifications, as shown in our front-page illustration, and flew straight across the bay, attaining a height of 1,300 feet above Cape Martin. Despite some rather strong wind gusts, the biplane flew with steadiness and without tipping dangerously. On his way back to the starting point Rougier performed evolutions above the casino of Monte Carlo at a height of 300 feet. Finally he flew back to the rock of Monaco, and landed with precision upon the narrow quay.

On March 8th he again started from the quay of the port, and flew straight for Cape Martin, across the bay. He rose to a height of 600 feet, described a circle above the bay, passed over the rocky shore at Monaco, and landed at his exact starting point after a 10-minute flight. The next day he made his longest and most spectacular flight. Starting at 5:10 P.M., he rose rapidly, and described a circle above the sea. Returning, he made two more circles above the Casino. Then, still rising, he flew above Mont Egel (elevation 2,625 feet). Passing over the summit, he flew to La Turbie, where he turned at a height of 300 feet, and flew back to his starting point. The length of this flight was 28 minutes and 34 seconds. On March 10th Rougier again flew around the Bay of Monaco, and on the 17th he made another fine flight of a quarter of an hour, in the course of which he passed 600 feet above Cape Martin, following the rocky shore of the coast in returning. These flights of Rougier on his Voisin biplane demonstrate that a considerable degree of automatic stability can be attained by vertical partitions between the main planes, and quite discredit the cabled report just received from France to the effect that the Voisin brothers have given up as impractical their system of inherent automatic stability, and have adopted wing warping instead.



Rougier flying over the yachts in the Bay of Monaco in his Voisin biplane.

THE AVIATOR FLEW OVER MONT EGEL (ELEVATION 2625 FEET), AND THRILLED MONACO FOR TWO WEEKS.

Aeronautic News at Home and Abroad.

LE BLON'S FATAL ACCIDENT.

Besides the record flights by Rougier above Monaco Bay, Le Blon, another famous automobile racing driver who has been flying a Blériot monoplane, made a wonderful flight above the Bay of San Sebastian, Spain, on the 2nd instant. He started in a high wind, and made several circles above the bay at a height of 150 feet, when suddenly the monoplane turned upside down, and fell into the shallow water. The intrepid aviator was instantly killed. His machine, like that of the ill-fated Delagrange, was fitted with a Gnome revolving cylinder motor of 50 horse-power. The excessive power and the gyroscopic action of the motor undoubtedly had something to do with both of these fatal accidents. Le Blon made a speed record of 46.19 miles an hour (5 kilometers in 4 minutes 2 seconds) at the Heliopolis aviation meeting near Cairo last January.

ACCIDENT TO A CURTISS BIPLANE.

While flying in a Curtiss biplane above San Francisco Bay at Alameda, Cal., on the 5th instant, Frank Johnson plunged into the water from a height of 80 feet, owing to his losing control of the machine. Fortunately he was uninjured, and was able to extricate himself from the aeroplane (which was not badly damaged) and to swim toward the shore. He was rescued by men in a skiff.

FIRST TEST OF PARSEVAL MONOPLANE.

The first test of Major von Parseval's large monoplane occurred on the 14th instant above Lake Plau, in Germany. This machine has a spread and length of 45 feet, and is fitted with a 120-horse-power 4-cylinder motor. The trial flights were made in a violent and gusty wind with two men in the machine. The monoplane capsized, and fell into the lake. The two engineers, Hoff and Blochman, were rescued. This machine is provided with both wheels and floats, but whether or not it started from the water, is not known as yet.

FLIGHT OF THE FABRE HYDRO-AEROPLANE.

Credit for producing the first aeroplane to rise from water and fly must apparently be given to M. Henri Fabre, who, according to the French journal L'Aero, succeeded in getting his combined hydroplane and aeroplane to leave the water and make several flights 1,200 to 1,500 feet in length at heights of from 6 to 10 feet. The experiments were made at the Port de la Mède at Martigues, a city near Marseilles. The first successful flight from water was made on March 31st.

NEW RECORDS OF FLIGHT WITH PASSENGERS.

On the 5th ultimo Henry Farman broke all records of flight with one or more passengers by carrying Mr. Hevardson, of the Daily Mail, and Mme. Frank for 1 hour, 2 minutes, and 25 seconds. The performance was accomplished with a new and smaller biplane than he has been in the habit of using. Just a month later, on the 8th instant, Daniel Kinet, a Belgian, broke the world's record for flight with one passenger by flying 2 hours and 20 minutes at Chalons. This record was also made with a Farman machine.

A NEW CROSS-COUNTRY RECORD.

Emile Dubonnet, on April 3rd, won the 100-kilometer (62-mile) cross-country flight prize offered by La Nature. He made a fine flight from Savigny-sur-Orge to Ferté-St. Aubin (about 68 miles) in 1 hour and 50 minutes.

EFFECT OF A PROPELLER BREAKING IN FLIGHT.

While practising at Pau with his Blériot monoplane on the 26th ultimo, Leblanc had a narrow escape. He was at an estimated height of 900 feet when his propeller broke and flew off. Quickly stopping his motor, Leblanc skillfully glided to earth amid the cheers of the spectators.

The Ascent of Mount McKinley.

Three months ago, a party headed by Thomas Lloyd left Fairbanks, Alaska, for the purpose of climbing Mount McKinley. The summit was reached on April 3rd, after a month of steady climbing. A camp was established at the base of the peak in March. The companions of Thomas Lloyd were W. R. Taylor, Charles McGonigle, and Daniel Patterson. Six other men were also included in the party, but they were left in care of the four camps established on the way toward the top of the peak. Up to 12,000 feet the ascent was easy, but the next 4,000 feet were climbed only by hewing steps out of solid ice. When the 16,000-foot level was reached, a final push was made by the four men named, with success. The expedition had its inception in the violent controversy which raged when Dr. Cook was lecturing. To settle the point whether or not he ever climbed the mountain, and to prove that it could be done, an expedition was financed by August Peterson and William McPhee. No trace of Dr. Cook's ascent could be found on either of the two peaks which constitute Mount McKinley. No records of his were discovered.

Various estimates have been made of the mountain's height. W. A. Dickey, an American prospector, estimated it at 20,000 feet, and gave the peak its present name. Robert Dunn, who made four attempts to climb the peak, estimated its height at 20,300 feet.

Inasmuch as the present party was not properly equipped to measure the height of the mountain, its achievement is not of much scientific value. Fortunately, Prof. Herschel C. Parker of Columbia University has expressed his intention of climbing the peak regardless of Lloyd's success. Dr. Parker will approach the peak from the southern side, and will study the glacier and various phenomena. He will take with him scientific instruments, by the skillful use of which undoubtedly more information will be obtained than could be secured by a party of four unscientific but hardy explorers.

Barril, the guide who exposed Cook, is inclined to dispute Lloyd's claim.

A New Way of Lighting Stages.

A new system of electric lighting for theater scenes was tried not long since at the Imperial Opera of Berlin, and, it is stated, with great success. It is the invention of the Spanish engineer, Fortuny, and uses an arc lamp as the source of light. The rays of the lamp, instead of falling directly on the scene, are thrown against a series of silk bands which are unrolled and set in any position by means of pulleys. The bands serve to reflect the light and change it into a perfectly diffused light. The new method also includes a sky which is formed in a quarter of a sphere and composed of a steel cap which is treated with a dead white coating. The diffused light is sent into this dome and gives the illusion of an unlimited space. Another interesting device is used to dispense with the ordinary clouds which always have a rigid appearance to the audience. These now appear to be quite plastic and mobile. Such result is secured by the use of mirrors which reflect painted screens representing the clouds. When the mirrors are rotated slowly, the clouds appear to slowly move over the sky. All the present system is worked from four small cabins which are placed in the auditorium. Competent persons are of the opinion that the present invention forms a considerable progress from an artistic as well as a technical and economical standpoint.

An Automatic Projecting Lantern with Electrical Control

BY JACQUES BOYER

Hitherto it has been necessary for a lecturer using lantern illustrations to employ an assistant to operate the lantern and insert each slide at the proper moment. M. Moulin has invented an automatic lantern (Fig. 1) which dispenses with the services of the assistant. The ingenious mechanism which inserts and removes the slides can be adapted to any projecting lantern and enables the lecturer, by pressing an electric button on the platform, to show any picture at will. The invention will be especially serviceable to teachers, as is shown by Fig. 4. The pictures can be thrown on the white wall of the class room, and if a powerful source of light is employed it will not be necessary to darken the room to an extent sufficient to prevent the taking of notes or the use of the blackboard.

The lantern slides are attached to a conveyor, composed of two chains connected by grooved cross-bars, which pass over a skeleton drum, formed of two iron disks connected by six rods. Each slide is firmly held between a fixed and a movable bar of the conveyor by

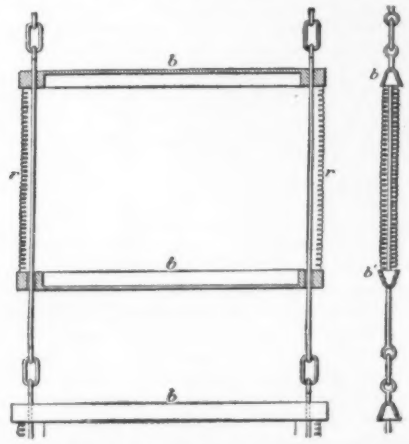


Fig 2.—Front and side views of chains carrying slide holders.

the tension of the spring *r* (Fig. 2). The drum is turned by a small electric motor, by means of a tangent screw, and, as it rotates, the slides are brought successively opposite the projecting lens. In this operation the flexible conveyor, carrying the slides, is taken up from a box behind the drum and delivered to a receiving box beneath the lantern.

The motor is shunt-wound, so that it can be reversed by reversing the current in the armature coils. In this way a slide which has already passed the lens can be brought back and projected again, if desired. The electrical connections by means of which the apparatus is controlled are shown diagrammatically in Fig. 3. Beneath the lecture table is a switch *I*, the closure of which sends a current through the electric arc *A* of the projecting lantern, and also through the field coils *S* of the motor, which are connected in parallel with the circuit containing the arc and its rheostat. On the table are two double contact keys *a* and *a'*. The upper contacts of these keys, 1 and 1', are connected with one wire of the general circuit; the lower contacts, 2 and 2', are connected with the other wire, and the fixed ends of the keys are connected, respectively, with the two brushes of the commutator attached to the rotor or armature *R* of the electric motor. Hence, when neither key is depressed, both brushes are in connection with the same main wire, and no current flows through the rotor *R*, which, consequently, remains motionless. By pressing the key *a*, the current is sent through the rotor circuit in the direction indicated by the arrows, and by releasing *a* and depressing *a'* the current and the rotation of the motor are reversed. The incandescent lamps *L* and *L'* are bridged on the

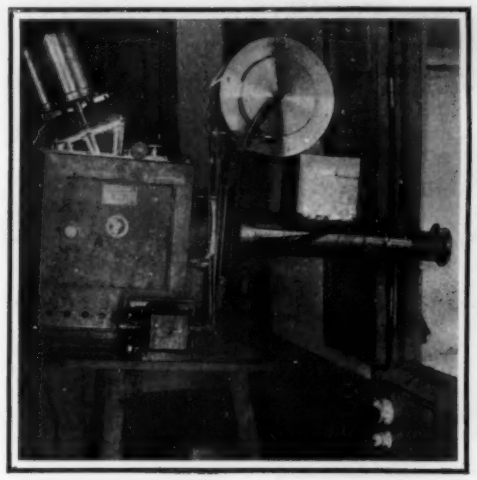


Fig. 1.—An automatic projecting lantern.

keys to diminish sparking, but they also serve another useful purpose. When the key *a* is partially depressed, so that it does not touch either contact, the rotor circuit is completed through the lamp *L*, which greatly increases the resistance of the circuit, and the current flowing through the rotor is further diminished by more than one-half by the shunt effect of the lamp *L'*. Hence, the motor turns so slowly that it is an easy matter to stop the desired slide exactly in front of the lens, by releasing the key *a* at the proper moment. Neither of these effects is produced when the key *a* is fully depressed, because the lamp *L* is then short-circuited by the key and the resistance of the circuit is thus made so small that very little current is diverted through the other lamp. A slow movement of the motor and the slides in the reverse direction is similarly produced by partially depressing the key *b*.

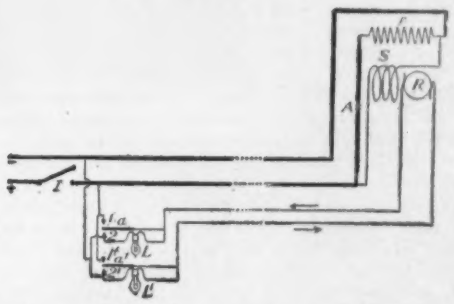


Fig. 3.—Electric wiring for automatic projector.

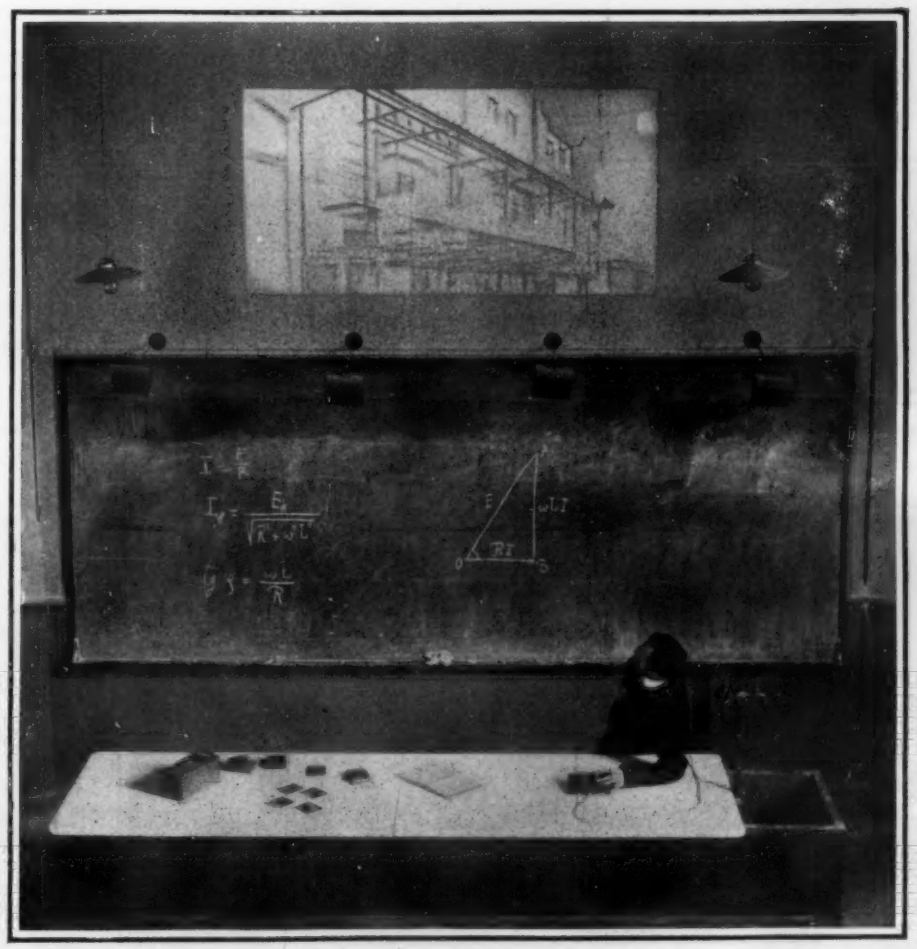


Fig. 4.—A lecture illustrated by the automatic projector, controlled by the lecturer himself.

AN AUTOMATIC APPARATUS FOR PROJECTING PICTURES.

Tides at Panama.

The average time of high water at places on the Pacific coast of the Central American isthmus is three hours after the moon's meridian passage at Panama. The average time of high water at Colon is six minutes, and at Greytown one hour after the moon's meridian passage at Colon. In other words, as Colon and Panama are nearly on the same meridian, it may be stated that high tide will occur at the Pacific or Panama end of the Panama Canal, on the average, two hours and fifty-four minutes after high tide at the Atlantic or Colon end; and high tide will occur at the Pacific or Brito end of the Nicaragua Canal route two hours after high tide at the Atlantic or Greytown end.

The level of mean tide is practically the same at both ends of both of these isthmian canal routes, but at Panama the tide ranges from 10 feet above to 10 feet below mean sea level, while at Colon it only ranges from 6 or 8 inches above to 6 or 8 inches below mean sea level, and at Brito or San Juan del Sur the tide ranges, in the extreme, from 4 feet above to 5 feet below mean sea level, while at Greytown it ranges less than 5 inches above and below mean sea level.

Thus with a sea-level canal built along either the Nicaragua or the Panama route, there would be through currents from the Pacific to the Atlantic at the times of high tides at the Pacific termini, and from the Atlantic to the Pacific at the times of low tide at the Pacific termini.

In answer to the specific question, "Assuming that the Pacific tide rises about 8 feet, suppose it to be high tide at San Juan del Sur, Nicaragua, at noon, standard time, what would be the approximate difference in level of the Atlantic at the same time, say, at Greytown, Nicaragua?" it may be stated that at the time of high tide at San Juan del Sur it is two hours after high tide at Greytown, and if the assumed rise of 8 feet at San Juan del Sur is above mean sea level, the difference in level between the two ends of the canal would be about 7¾ feet.

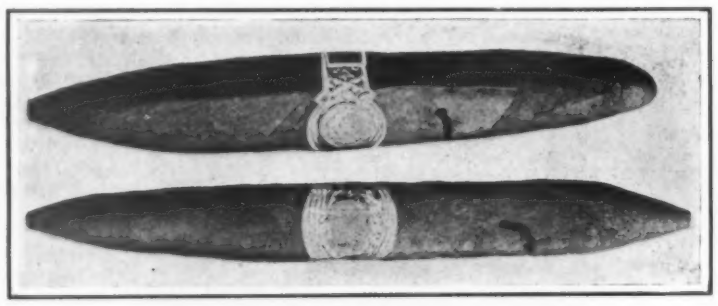
To secure accurate information with reference to the weather conditions, Dr. William Shaw, Director of the Meteorological Office of Great Britain, has been traveling in western Canada. With reference to the alleged general changes in the climate, owing to the settlement of the country, Dr. Shaw is skeptical. He states that he has observed that the people of all localities are under the impression that the climate of their district is undergoing a change. The statistics do not, however, bear out this idea. There are oscillations, but no permanent changes in the climate.

INSECT PESTS IN HOUSE AND STORE

BY HAROLD BASTIN

Insects as a class feed literally upon anything and everything from which nourishment may be extracted by dint of strong jaws backed up by equally strong digestions. A substance may be "bone dry," almost as hard as rock, and in every way uninviting; yet so long as its origin is traceable to the animal or vegetable kingdom, at least one insect—probably very many kinds—will find in it the wherewithal of existence. And because they are omnivorous in the fullest sense of the word, insects rank as the worst pests with which civilized man has to contend, whether his calling be that of a producer or a disseminator of the necessaries and luxuries of life. Much has been written respecting the depredations of insects. Everyone will probably know something at least of the tax which has been imposed upon the exchequer of this country by such insects as the Colorado beetle and the "scale" of the orange groves. But it is with certain pests which, while less devastating in their activities, affect closely the individual comfort of our readers that the writer proposes briefly to deal in this place. Probably few people realize what a number of insect pests are to be found in the ordinary house or larder. Insects penetrate the very fabric or our dwelling-places—that is, so far as the woodwork is concerned. They burrow into our furniture and our books, and consume by slow degrees the very carpets on our floors and the clothing in our closets and presses.

Among the most widely distributed of these domestic pests are certain tiny beetles of the genus *Anobium*. Their ancestral home was in the woods and lanes, where they are still abundantly represented, frequenting the dead branches of trees and shrubs. They have, however, forced an entry into almost every old house in the land, as well as into many a modern dwelling, where they accomplish considerable mischief by boring into and consuming furniture, beams and woodwork in general. This successful assault of our houses must have been accomplished many centuries ago, for one of the commonest species was dubbed "*domesticum*" by the old naturalists, and is so called at the present day. This insect is barely one-sixth of an inch in length, gray-brown in color, cylindrical in shape, with its head hidden in, or overhung by, the thorax. The tiny grubs are soft-bodied, with hard heads and—as their work bears witness—powerful jaws. It is not difficult to detect the presence of these grubs in woodwork. Suppose that you have a valuable Chippendale chair, and that you notice beneath it, upon the floor, certain little heaps of yellowish dust. Inspection of the chair itself reveals minute holes scattered about the surface of the woodwork—much as though the piece of furniture had been "peppered" from a distance with a charge of dust-shot. These signs are indisputable evidence that your chair is beetle-riddled; and unless by some means you can



Cigars damaged by the tobacco beetle.

contrive to dislodge the pests, they will slowly but surely reduce the woodwork to dust and chips.

When once a piece of furniture is assailed by *Anobium*, it is a very difficult matter to eradicate the pest. Several methods have been suggested. One plan is to place the piece of furniture in a refrigerating chamber

Dust from the borings of the cork-caterpillar on a bottle-neck.

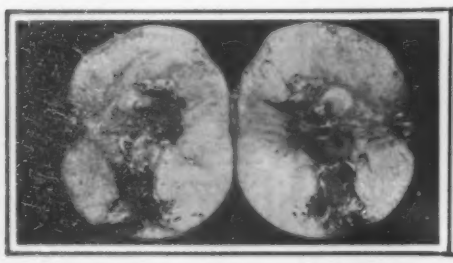
Wine bottle cork showing the burrowings of the cork-caterpillar.

for a week or two, and thus attempt to kill the beetles and their grubs by cold. It is somewhat doubtful, however, whether even this severe ordeal will destroy all the beetles. Another way, and probably a more effectual one, is to place the furniture—first taking it to pieces if necessary—in a hot chamber or oven, and there bake it for twenty-four hours or more. If the temperature be kept a little above that of boiling water, not a single beetle will be alive when the baking is over. Often it would be impossible to adopt either of these methods, and in such cases the best plan is first to place the piece of furniture in a very hot room for some hours, then to inject, by means of a very fine-nosed syringe, a poisonous liquid—such as creosote or cyanide of potassium—into as many of the tiny "worm holes" as can be found on the surface. Then remove the furniture at once to a cold place, when the sudden change of temperature will cause the poisonous fumes to be drawn into the innermost recesses of the burrows. Finally, the holes on the surface should be stopped up with paraffin wax.

The various species of *Anobium*, and their bigger relatives of the genus *Xestobium*, by no means confine their attacks to furniture. The whole woodwork of old houses has been so completely riddled by their borings as to render the structures unsafe. Indeed, a beam that has been tenanted by these insects for a number of years is little better than an outer shell containing a mass of wood-dust. A photograph showing damage done to woodwork is here reproduced. *Xestobium*, by the way, is the common "death-watch," while *Anobium* also is in the habit of making a tapping sound. The nocturnal tapping of these insects, distinctly audible in a room where there is an otherwise complete absence of noise, has for many centuries been regarded by the superstitious as a warning of the approach of death. This uncanny interpretation of a mysterious sound is scarcely surprising when we remember that only in recent years have naturalists discovered its true cause. The little beetle has been found in some secluded spot, jerking its hard head at regular intervals upon the surface of the wood beneath it. So far as can be told, its rappings constitute a kind of courtship ritual. Obviously they have no connection with the latter end of mankind. So that the old "death-watch" theory has been exploded!

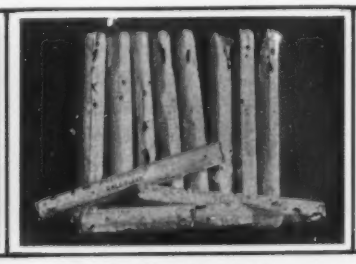
While speaking of these beetles, the writer may mention another insect, known as the "book-louse." It is very minute, soft, and wingless. Its color is that of pale amber, while it is not distantly related to the "white ants" of tropical countries. *Atropus divinatoria*, to give the book-louse its scientific name, is very common in old houses, especially if they are damp. As its popular name indicates, it may be found among old books and manuscripts, where it seems to browse upon the surface of the paper. It has also been known to damage collections of dried plants and in-

(*Continued on page 348.*)

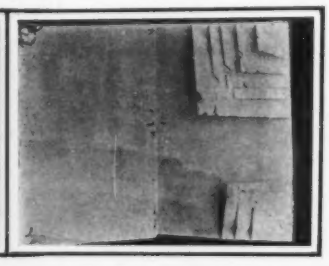


An apple (cut in halves) which has been the home of a caterpillar of the codlin-moth.

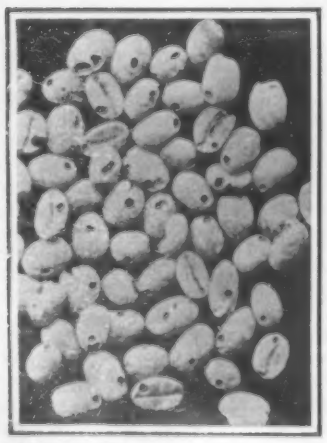
Ginger root attacked by the paste beetle.



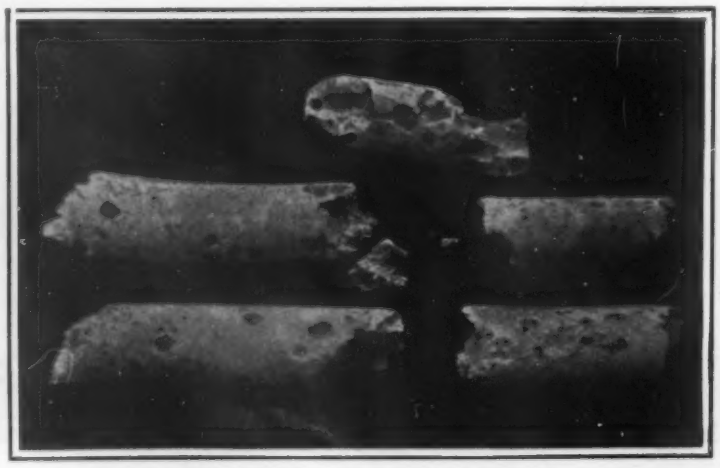
Cigarettes damaged by the tobacco beetle.



A book showing the ravages of the "book-worm."



Old Java coffee beans showing the borings of a beetle.



Macaroni attacked by the paste beetle.

Grains of wheat (magnified) which have been eaten into by the corn weevil.

INSECT PESTS IN HOUSE AND STORE.

Patent Department

FIRE-PROOF CONSTRUCTION AND OUR ANNUAL FIRE LOSS.

It is estimated that our annual fire loss, and the sum expended for fire protection, etc., represent an annual sum that is approximately equal to the cost of building the Panama Canal. The public is awakening to the economic significance of this fact, and business men generally are beginning to realize that the best way to guard themselves against the fire peril is, not so much to institute elaborate means for extinguishing fires and burden themselves with heavy insurance, as to so erect their buildings that it will be difficult for a serious fire to originate, and, if it does, impossible for it to obtain a serious hold upon the building. The growth in favor of fireproof construction has been indirectly stimulated by the growing price of lumber, the advance having been so great that for some forms of construction there is but little extra initial cost involved in putting up strictly fireproof construction. Indeed, from an investment standpoint it can be demonstrated that the fireproof building is the only really economical building. The saving in the cost of insurance, reduction in depreciation charges, the guarantee against interruption of business by fire, combine to make an unburnable building the cheapest in the long run.

The phenomenal development in reinforced concrete construction must be regarded as one of the most significant movements in the broad field of architecture and engineering. It is not too much to claim that the lion's share of improvements in this direction is to be credited to American engineers. The experimental work on sample structural members, and especially upon beams and columns, has led to a pretty thorough knowledge of the true principles of construction to be adopted for reinforced concrete when used in such members; and the introduction of a reinforcement designed to adequately take up the shearing strains, as supplied for instance in the Kahn system, has made it possible to produce beams, girders, stringers, and other members subject to bending stresses, whose strength can be determined with dependable accuracy.

Side by side with the development of reinforced concrete members, such as are suitable to what might be called the skeleton frame of concrete building, much experimental work has been done in producing a suitable form of walling or paneling, for filling in the broad open surface represented by the wall spaces, the floors and the roofing. In the accompanying illustrations we show what is known as the Hy-Rib method of steel sheathing, which is an interesting case of development along this line. It consists of a special steel lath stiffened by rigid high ribs, both the ribs and the lath being made from the same sheet of steel. The object of the ribs is to give sufficient stiffness and rigidity to the lath, so that when used in walls and partitions no studs, such as are required by the ordinary plain lath, will be necessary. When it is used as reinforcement for floor and roof slabs, no wood centering or falsework is required; for the ribs give the required stiffness. If this sheathing is used for partitions, it is merely necessary to provide a fastening at the floor and the ceiling. The sheets are then set in place and the plaster applied directly to both sides.

For sidings of factories and similar one and two-story buildings, a framework of steel or concrete is provided to which the sheets are attached. Lines of supports are provided, about six feet apart, and the Hy-Rib is properly fastened to them. The framework is similar to that which would be provided where the ordinary wood sheathing or corrugated iron is used, except that the girts can be placed a greater distance apart. When the steel has been properly placed a special stucco plaster is applied in two coats.

Where the system is used in connection with floors and roofs, supports are ordinarily provided about five feet apart. The sheets are laid directly over the supports with the lath face downward. All that is necessary to complete the work is to put in the concrete on the upper sides of the sheets to the required thickness. Only a sufficient amount of concrete will flow through to give a thorough clinch on the steel. This leaves a roughened surface on the underside, which provides a satisfactory key for the plaster applied on the ceiling below. By use of reinforcing materials similar to this, nearly every type of building, no matter how small, may be built fireproof at a cost very little greater than the ordinary wood framing.

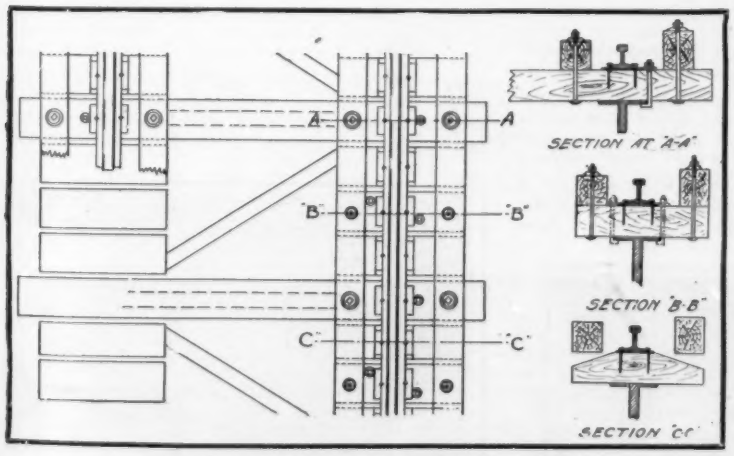
Applying the plaster to a rib-stiffened steel lath and plaster partition.

Building a roof of reinforced concrete construction.

FIRE-PROOF CONSTRUCTION.

IMPROVED ELEVATED RAILWAY CONSTRUCTION.

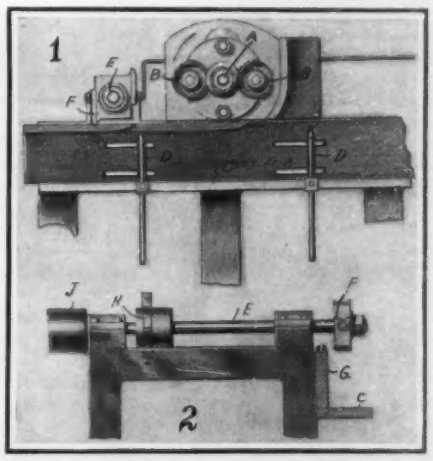
The combination cross tie and "block" tie construction shown in the accompanying drawing has for its object to reduce the noise of elevated railroads and increase the light to the street below. An open construction is provided, yet the rails have an almost continuous support, which tends to absorb and stop the vibration sent out from the rails. Most of the noise from a train on an elevated structure is due to the passage of the wheels over the rail joints and there is no doubt that this noise is intensified by the inefficient support of the rails at such points. Should the three "block" ties be removed, letting the rail free of support, and a wheel be rolled over the rail, the vibrating noise would be very great. By inserting "block" ties between, this noise is decreased in proportion to the number of ties inserted until when a continuous support is made the noise is reduced to a minimum. It is but natural for engineers to copy precedents, and for this reason the usual system of cross ties, which, by a process of evolution, has been found most satisfactory for a road constructed on the ground has been adopted for elevated railroads, with the result that an excessive amount of noise is produced whenever a train passes over the rails, and the street is unnecessarily darkened by the multiplicity of cross ties. This proposed system of building an elevated railroad has been suggested by Mr. Carl R. Klok, of 1243 Columbia Avenue, Chicago, Ill.



IMPROVED ELEVATED RAILWAY CONSTRUCTION.

ATTACHMENT FOR WOODWORKING MACHINES.

The accompanying engraving illustrates an attachment for woodworking machines generally known as molders or stickers used in sash and door factories for cutting rabbets and moldings in the parts to receive the panels. When a door is to be provided with a pane of glass, it is usually necessary to cut away the molding or rabbet at one side, so that the glass can be inserted when the door is completed and be held in position in the usual manner by means of putty. In order to avoid a second operation to cut away the molding for this purpose, the auxiliary cutter shown in the accompanying engraving is provided. The auxiliary cutter is arranged to be moved axially into and out of operative position, so that when it is no longer desired to cut away the molding the operation of the auxiliary cutter can be stopped. In Fig. 1, which shows a face view of the machine, the main shaft is shown at *A*, and mounted upon it is the main cutter head, provided with the cutters *B*, which form the rabbet and molding. Immediately in front of the cutter head is a table *C*, on which the work is supported, and a pair of guides *D*, for holding the work in position. The auxiliary cutter is mounted on a shaft *E*. It consists preferably of a square cutter head provided with a pair of blades *F*. Fig. 2 shows a side view of the auxiliary cutter moved to inoperative position so that it clears the work *G* supported on the table *C*. The shaft of the auxiliary cutter is provided with a yoke, and collar *H*, by which it may be moved axially so as to bring the cutter into engagement with the work *G*. The driving pulley of the shaft *E* is shown at *J*. The inventor of this attachment is Mr. A. C. Tippett of 1283 Franklin Avenue, Astoria, Oregon.

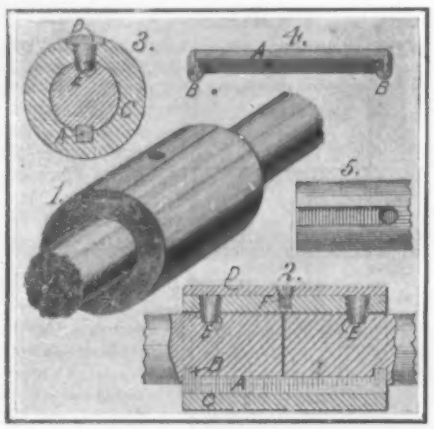


ATTACHMENT FOR WOODWORKING MACHINES.

SHAFT COUPLING.

Pictured in the accompanying engraving is an improved coupling of the type adapted for connecting the abutting ends of two revoluble shafts. Briefly, the device consists of a key and a sleeve which serves to hold the key in place while a second locking key serves to retain the sleeve in position over the two shafts. As shown more clearly in the sectional view Fig. 2, and in Fig. 5, a keyway is cut in each shaft, and a pit or recess is formed at the end of the keyway. The shafts are turned so that the two keyways are in alignment, and then a key of the form shown in Fig. 4, and indicated at *A* in Fig. 2, is fitted into the keyway. The key is provided with lugs at the end, adapted to fit into the pits of the keyways. Before bringing the shafts together, a sleeve *C* is fitted over one of them. This sleeve, as shown in the cross-sectional view, Fig. 3, is formed with a keyway adapted to fit over the key *A* when it is moved over the abutting ends of the shafts. To hold the sleeve in position, the key *D* is used. This fits into an exterior keyway in the sleeve *C* and is provided with a pair of lugs *E*, which pass through the sleeve and into the two shafts. A screw *F* serves to hold the key *D* to the sleeve *C*. In this manner the two shafts are rigidly connected. Owing to the large

diameter and massive construction of the sleeve *C*, and owing to the manner in which the two keys are interlocked, the coupling has a strength equal to that of any portion of either shaft. When the shafts are coupled they are in precise alignment with each other, and it is impossible to turn one shaft relatively to the other except by a force sufficient to mutilate them to a considerable extent. A patent on this coupling has



A STRONG SHAFT COUPLING.

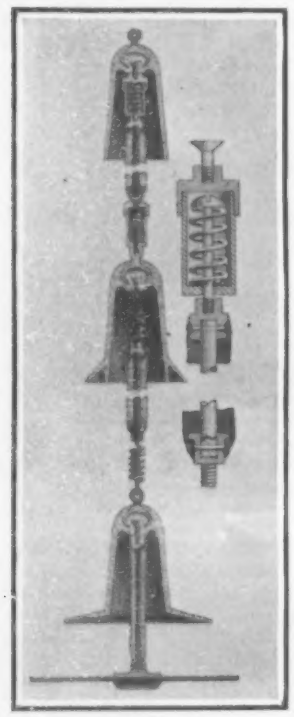
been secured by Mr. William F. Baum, of 2302 Cedar Street, Philadelphia, Pa.

A NEW SYSTEM FOR HIGH-TENSION INSULATION.

A patent recently issued to Louis Steinberger of Brooklyn, N. Y., covers a novel and improved system of insulation for high-potential electric conductors to be used in various relations and for various purposes, such as power transmission and for guy wires or cables employed as stays for towers or poles, masts, and other supports used in wireless telegraphy and telephony, as well as in regular commercial work. It marks a radical departure in the development of insulator systems.

The system comprehends a series of insulators, preferably of a thimble type, and a series of other insulators of a rod type, the thimble-type insulators being alternated with the rod-type insulators, and together therewith forming a flexible chain of parts which may be extended indefinitely.

The under surface of the thimble-type insulators will be, of course, at all times comparatively dry. Each thimble-type insulator acts like an umbrella covering the upper end of the rod-type insulator below it and connected therewith, thereby keeping it dry under the most unfavorable conditions (as, for instance, when all the insulators are subjected to the action of a driving rain); hence the group of insulators must always afford adequate insulation for all practical purposes.



A NEW SYSTEM OF HIGH-TENSION INSULATION.

This system will practically prevent leakage and undesirable grounding of the current either from conductors or from supporting structures for the same.

In this system the various parts may be readily detached and replaced by other parts, and the total number of parts may be increased or diminished at will after the original structure is built, this feature being especially important in instances where, after the installation of a conductor, the voltage is to be increased.

Not the least important feature of the system is the flexibility of the chain of units and that the structure as a whole when in operation is under spring tension, thereby insuring more or less resiliency, so that the complete structure is relieved to all of its parts, as well as in its entirety, from the effects of sudden and abrupt accidental strains, usually so destructive to mechanism of this kind.

SIMPLE LETTER SCALE.

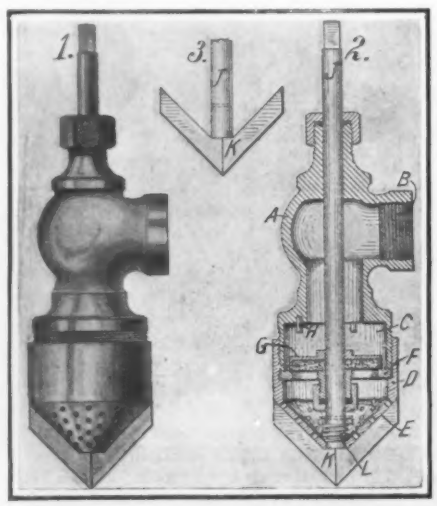
An inventor has recently struck upon the simple idea of using coins to weigh letters, so that the value of the coin will represent the value of the stamp that must be applied to the letter. A simple beam scale is used, provided at one end with a clip for holding the letter and at the other end with a clip for holding the coins. If the scale is to be used for first-class mail, the rates for which are two cents an ounce, the fulcrum of the scale is so placed that a letter weighing an ounce would be just counterbalanced by two one-cent coins in the other clip. As shown in our illustration, the scale beam is made of sheet metal bent to channel form with the ends turned over and terminating in knife-edged pivots on which the letter and coin clips are suspended. A detail of one of these clips is shown in Fig. 2. It is made of a single piece of metal bent to form two jaws, which may be roughened or crimped to provide a better gripping surface. At the upper end of the clip are two ears bent upward and provided with apertures to receive the pivots of the scale beam. A bail-shaped handle serves as a fulcrum for the scale. In order to adjust the scale accurately, a metal poise is provided on the under side of the scale beam. The scale beam is formed of two ears, which pass through a slot in the poise and are bent back upon it to hold it in place, as indicated in Fig. 3. The poise may be delicately adjusted to bring the scale to a correct balance. The inventor of this ingenious letter scale is Mr. Willis J. Fink, of Elk Point, South Dakota.

INLET VALVE AND SCREEN FOR PUMPS.

The device which is illustrated in the accompanying engraving is adapted particularly for use in con-

SIMPLE LETTER SCALE.

nection with water pumps in boats, the object being to strain the water that is drawn in by the pump. The strainer is provided with a special attachment whereby it may be cleansed instantly while the valve is in service. The body of the valve is indicated at *A* in the illustrations and is provided with a branch *B*, whereby it may be connected with the pump. The lower portion of the body is enlarged to form a valve cage *C*. Screwed to the cage is an extension member *D*, which, at its lower end, is formed with a screen *E*. A valve seat plate *F* is secured in the chamber *C*, and upon it rests the valve *G*. Lugs *H* in the top of the chamber *C* serve to limit the upward lift of the valve *G*. Passing centrally through the valve and casing is a rod *J* which, at its lower end, is fitted with a pair of blades *K*. These are adapted to be pressed against the outer



INLET VALVE AND SCREEN FOR PUMPS.

surface of the screen *E* under tension of a coil spring *L*. By rotating the rod *J* the blades *K* are caused to scrape the screen *E*, and thus remove any dirt that might clog the openings of the screen. Mr. Olof H. Lillyman, of Potlatch, Idaho, has just secured a patent on this improved inlet valve and screen.

THE INVENTOR OF DIVING ARMOR.

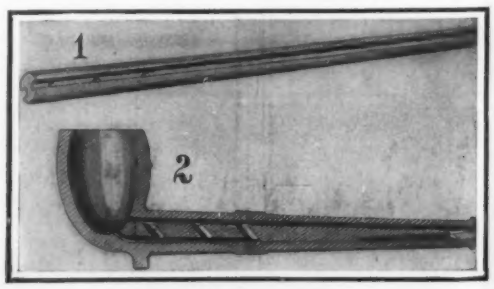
Among pioneer inventors, to whom the diving dress in its present perfected form owes so much, was William Hannis Taylor. The previous "hit or miss" attempts were superseded by the Taylor patent of June 20th, 1838 (No. 578) in which the essential feature was the valve allowing the emission of consumed air without an influx of water. Previous to this time, there had been the diving chests and the diving bell, of which the latter, introduced by Smeaton in 1778, was the safest and most practical device for submarine exploration. The diving bell has been developed alongside of the diving dress, and is still in use.

FIRST DIVING ARMOR.

The general appearance of Taylor's diving armor was like that of a knight's suit of mail, except for a prominent bulge in the body piece. A large pipe coming down from the surface, and penetrating the body piece at the bulge, supplied the fresh air, while a short pipe entered the body piece on the other side, and was provided with a valve which carried off the exhaust. Although diving armor has now reached its perfected state, this valve has never been materially improved upon. The accompanying illustration is reproduced from Mr. Taylor's patent.

AN IMPROVED TOBACCO PIPE.

The principal objection to a tobacco pipe, as every smoker knows, lies in the fact that nicotine accumulates to such an extent as to partially clog the stem, and detached particles of the distasteful drug are apt to be drawn into the mouth. The saliva is also apt to flow into the stem and collect there. To obviate these disagreeable features of the ordinary stem, many inventions have been made designed to trap the saliva and the nicotine. The accompanying engraving illustrates one of the latest inventions along this line. The pipe bowl is provided with two openings, one above the other, and these are adapted to communicate with two channels in the stem. The stem is provided with a core piece in which the channels are formed. The core is indicated in the cross-sectional view, Fig. 2, and is shown in full in the large view, Fig. 1. The upper channel extends the full length of the core and through this the smoke is drawn. Near the inner end of the stem, the core is provided with several ducts extending downwardly and rearwardly to the lower channel of the core, so that any nicotine or solid and liquid particles drawn up with the smoke will be trapped by the ducts and will accu-



AN IMPROVED TOBACCO PIPE.

mulate in the lower channel. It will be observed that the lower channel does not extend the full length of the core, so that it is impossible to draw any of the nicotine into the mouth. At the opposite end of the core a chamber is formed in the bottom of the core piece, which communicates with the smoke channel near the mouthpiece. This serves to trap the saliva that may enter the smoke channel. The stem of the pipe is jointed near the center so that the outer section may be removed and the core piece withdrawn for the purpose of cleansing it. The inventor of this improved pipe is Mr. George Bradley, of 910 Boone Avenue, Spokane, Wash.

RECENTLY PATENTED INVENTIONS.

Pertaining to Apparel.

GARMENT-RACK.—G. M. VAIL, New York, N. Y. This invention refers more particularly to a rack which can be folded into a compact form, which has hooks for use in supporting garments and like articles, and can be arranged in a plurality of positions, operative and inoperative, and which includes suitable means for supporting the rack from a nail or the like.

Electrical Devices.

THERMO-ELECTRIC FIRE-ALARM. — G. BLACKHALL, Toronto, Canada. This alarm is especially useful in buildings, such as factories or warehouses, for the purpose of giving an alarm in case of fire. It is also intended to be used in the holds of ships or in other situations where a local rise in temperature may be utilized to indicate the existence of fire.

CARBURETER AND CONTROLLER FOR INTERNAL-COMBUSTION ENGINES.—J. L. TATE, Jersey City, N. J. In the present patent the invention is particularly applicable to systems in which an internal combustion engine is employed for driving a generator and the current from the generator is used for operating a motor or for doing any other suitable form of work. Such a system is illustrated in a prior application for a patent filed by Mr. Tate.

ELECTRIC CUT-OUT.—P. T. MCNALLY, Mandan, N. D. The invention relates to devices for operating at a distance, electric switches in branch lines of electric circuits whereby the current may be cut in or out in said branch lines either from the power house or any remote station, thus controlling the current on said branch lines without cutting off the current in the main line leads.

TELEGRAPH INSTRUMENT. — W. MCL. JACKSON, Gastonia, N. C. The main object here is to provide means whereby the "dots" which are used in the ordinary Morse telegraph code, may be made by the single pressure of a key, thereby doing away with the staccato movement of the finger of the operator. Long continued use of the movement causes the finger and hand of the operator to become fatigued and often results in telegraphers' paralysis.

Of Interest to Farmers.

TREAD-MOTOR.—P. W. PETERS, Woodland, Wis. In this case the aim is to provide a smooth and easy running device provided with a gate which may be opened and closed to permit the ingress and egress of the draft animal, and wherein the act of opening the gate will lock the wheel from movement.

MACHINE FOR GATHERING COTTON.—W. W. EDGE and K. F. CAMPBELL, Jud, Texas. The aim in this improvement is to provide features of construction for a cotton gathering machine, which enable the removal of cotton burs containing ripe cotton from the plants, directly into a receptacle as the machine is moved along rows of cotton plants in a field where they have grown.

Of General Interest.

MOLD.—P. H. ALLISON, Torrington, Conn. This mold is for use in casting ingots, such as brass bars, to be subsequently rolled into sheet or other form. It is capable of being opened and closed without taking up much floor space, and arranged to prevent the formation of fins and to allow convenient and quick removal of the casting irrespective of any change in the members of the mold owing to expansion and contraction.

TRUNK-PROTECTOR.—E. N. THAIN, Franklin, Mass. The protector is such as used in connection with trunks, boxes, and other receptacles, for the protection thereof, and each of which in general includes a number of corner guards adjustably connected to one another by means of tie members, whereby an upper and a lower frame are formed, and adjustable means joining the frames to hold them in position on a receptacle.

UMBRELLA.—R. L. SUSEMIHL and T. SUSEMIHL, New York, N. Y. An object here is to provide a folding umbrella, which can be disjointed and folded into a compact form, which takes up but very little space, which is easily manipulated both in opening and closing and folding the umbrella, and which is strongly constructed, so that sudden gusts of wind or the like cannot easily injure or disarrange the frame.

INDEX OR DIRECTORY.—D. T. O'SULLIVAN, West Orange, N. J. In the present invention the improvement has reference to indexes or directories having alphabetically arranged words or names. The object is to produce an index or directory having means for facilitating the finding of any name which is sought, and which will relieve the mind.

FILE-CABINET.—W. J. BALL, Alanreed, Texas. The purpose of the inventor is to provide an accounting device for use in retail stores and like business places which transact business with a large number of customers each day, which may be easily understood and operated, and which will eliminate a large amount of unnecessary book work, while at the same time preserving a correct account of each and every transaction.

Hardware and Tools.

STENCILING AND MARKING POT.—T. F. ARDIZONE, New York, N. Y. This pot is for use in holding inks and other substances which can be easily manipulated, which is so constructed that the ink can be easily taken up upon a brush or other device used in stenciling and marking, in painting, and for other purposes in which the ink is prevented from settling, and which has means for freeing the brush from excess quantities of ink.

FISHERMAN'S NEEDLE.—W. J. MAY, New Orleans, La. The object here is to produce a needle such as used by fishermen for repairing nets and seines and having a special construction, including a knife which can be readily operated when desired. Under normal conditions the edge of the knife does not protrude from the body of the needle so that the blade is held in an inoperative position.

VALVE OR FAUCET.—E. P. MCCOLLOM, Baltimore, Md. This device is intended more particularly for embodiments in faucets used in connection with a filter the bottom of which seats on the chambered top of the faucet. The valve in the faucet coacts with a novel arrangement of ports and passages for directing the water from the supply pipe through the filter or merely against the bottom of the filter to wash the same and then directly through the faucet; or the valve may be so turned as to cut off the supply pipe and drain the filter.

STAMP AND LABEL AFFIXER.—G. E. LACEY, Lansing, Mich. The invention pertains to a device to be used in affixing stamps or labels to letters or articles of manufacture. One object of the invention is to provide a device which will automatically grip a label or stamp and dispose it in proper relation on the surface to which it is to be affixed.

DOOR AND DAMPER OPERATOR.—J. LAUS, JR., Oshkosh, Wis. The invention is an improvement in door and damper operators, and the object is to provide a spring operated mechanism normally restrained from action for opening and closing, the dampers and doors of a furnace or the like at a predetermined time, which mechanism is released by a clock movement.

Heating and Lighting.

WATER-HEATER.—J. W. HARDIE, Sourlake, Texas. This device is for use for heating feed water in oil or gas burning boiler furnaces. The invention has reference to improvements in feed water heaters and has for its object the provision of an improved apparatus for the rapid and economical heating of water for steam purposes in oil and gas burning boilers.

Household Utilities.

FLY-EXIT.—L. W. CLARK, Carterville, Mo. The object here is to provide a device of low cost which may be applied to the ordinary window screen with but little cost or trouble, and which will permit flies free egress from the room or building, while at the same time effectually preventing their ingress.

PORTABLE FLY-CATCHER.—C. H. PEARCE and L. T. TEUSCHER, Aspen, Colo. In this instance the invention relates to improvements in portable means for catching flies. The invention has for its object the provision of a device by the use of which the flies in a house or dwelling may be removed quickly and effectually, while at the same time obviating all of the disadvantages of foregoing methods.

Machines and Mechanical Devices.

MACHINE OR APPARATUS FOR PRINTING, CHECKING, AND AUTOMATICALLY SUMMING UP THE VALUES OF TICKETS OF DIFFERENT KINDS AND SERIES.—G. I. F. SOULAGE, 44 Rue Chanzy, Paris, France. The invention provides a small portable machine for use in printing and checking tickets of different classes and kinds and for automatically adding up corresponding receipts. It effects by a single operation, first, the impression upon each ticket of the date, destination, price, route, and number of days available. Second, the simultaneous impression upon a checking sheet of all data placed on the ticket. Third, the automatic adding up of the sums collected.

STREET-GAGE.—P. ROUGHEN, Fond du Lac, Wis. This device detects inequalities in grading of street pavements; mechanically adjusts the height of the crown of the paved street; is movably and guidably mounted on the street, to be readily shifted over its surface, and is capable of being adjusted to varying street widths.

TYPE-WRITING MACHINE.—N. F. PETIT, Charleston, S. C. Among the principal objects in view in this case are: To provide a construction to occupy a minimum of space; to provide an arrangement of type wherein a number of characters may be arranged to be employed; and to provide a portable machine which is simple, economical and durable in construction.

COMBINED BALL AND TUBE MILL.—J. E. KENNEDY, New York, N. Y. This mill is adapted to comminute ore, cement or the like from a comparatively large size to a fine powder. It is adapted for use in wet or dry crushing and consists primarily in a tube-chamber in which crushing is done in two stages. It performs in one machine that which formerly took two to accomplish.

DRILLING-MACHINE. — G. MCKNIGHT, Townsend, Mont. This machine affords a positive manually-controlled feed for the drill, and facilitates its withdrawal from a bored hole when desired, and also provides reliable means for detachably securing the drilling machine upon an object that is stationary, or has sufficient weight to afford proper support to the machine when in use.

STATION-INDICATOR.—E. K. HARRIS, Canandaigua, N. Y. The indicator is intended for use in passenger cars or other vehicles for indicating the next station at which the car or vehicle is to stop. More particularly the invention relates to that type of station indicator in which there is provided a long band or curtain bearing the names of the successive stations and movable to bring successive portions to view.

WIRE-FENCE MACHINE.—D. A. CLAWSON, Waynesville, Ill. This machine is for use in making wire fences in the field, and arranged for ready attachment to the line wires of the fence, to properly guide or hold the stays while attaching the same to the line wires, and to permit ready attachment of the machine to the line wires to allow the operator to accurately fasten the stays in proper vertical position to the line wires.

KEG-RINSER.—A. C. LA BUDDE, Ashland, Wis. The invention consists of a water supply conduit having a nozzle and a controlling valve, a foot lever operable to simultaneously project the nozzle valve into the keg and open the valve, and rollers to support the keg over the nozzle, each roller tapering toward the center to conform to the keg and facilitate its movement to rinsing position.

LUBRICATING ATTACHMENT FOR WINDING-MACHINES.—S. BROADWIN, New York, N. Y. The invention relates to applying a lubricant to yarn, thread, or the like, in being wound onto a spool, bobbin, or spindle. The object is to apply it to the thread after it is wound on the bobbin or the like, the lubricant preferably being in solid form and held against the sides of the several windings on the bobbin as the latter rotates.

SCALE.—A. P. JOHNSTONE, Cleveland, Ohio. The invention provides a scale having a pouring attachment to deliver only when the receptacle is in receiving position; a pouring attachment adjustable above the scale platform; a locking attachment for the scale beam to prevent the flow from the pouring device, except under conditions; a pouring attachment to handle plastic and dry materials, with spout openings; and an electrically-operated mechanism for terminating the delivery from the pouring device when the desired weight has been obtained.

Railways and Their Accessories.

MAIL-BAG CATCHER AND DELIVERER.—G. E. DENISON, Vernon, N. Y. This is a device adapted to receive mail or other packages from and deliver mail or other packages to, a moving train from a stationary platform. An object is to provide a device which will suspend the mail bag or other package in a locked position until a trigger is tripped by opposing mechanism.

RAILWAY-CAR BRAKE.—L. BOIRAULT, 8 Rue Emile-Gilbert, Paris, France. The invention consists in making use of the live force of the car to produce the application of the brake in such manner that when the system of operating levers has been brought by hand or through gearing into a determined position, a cam operated by a car axle actuates the system of levers and produces the application of the brake-blocks to a determined extent and locking them in braking position.

Pertaining to Recreation.

DANCING DOLL.—A. M. PRESTON, Broxton, Ga. In this instance provision is made for disassembling and packing the separated parts in the stand; for a construction whereby the doll is manipulated to simulate the movements of a dancing person; and for a construction for a doll which is simple, efficient, and the wearing parts whereof are rapidly and easily replaced.

Pertaining to Vehicles.

TIRE-TREAD.—D. T. O'SULLIVAN, West Orange, N. J. An object of this invention is to provide a tread having a form which facilitates its attachment to the wheel, without producing a puckering of the material at the sides of the tread. Also to provide means for securing the tread to the spokes of the wheel, which will prevent slipping and longitudinal slipping of the tread on the tire.

PORTABLE PRISON.—J. B. KIMBELL, Cordele, Ga. This invention is applicable to vans for use in transporting convict laborers. Heretofore they have been carried in confined quarters. Considerable inhumanity has resulted from the too close confinement during leisure, such as after working hours and on Sundays and holidays in which this class participate. The chief purpose is to overcome the above disadvantages by forming a single detention room or house.

VEHICLE-TIRE.—H. B. TOBIAS, Hoboken, N. J. The invention comprises the combination of a rim, cushions mounted thereupon, a composite member, having generally an annular form, encircling the rim and with portions engaging the cushions, a plurality of members arranged in a general annular form and connected to the composite member, the last members overlapping one another, and a tread supported upon the last mentioned members.

NOTE.—Copies of any of these patents will be furnished by Munn & Co. for ten cents each. Please state the name of the patentee, title of the invention, and date of this paper.

Legal Notices

PATENTS

INVENTORS are invited to communicate with **Munn & Co., 361 Broadway, New York,** or **625 F Street, Washington, D. C.,** in regard to securing valid patent protection for their **inventions, Trade-Marks** and **Copyrights** registered. **Design Patents** and **Foreign Patents** secured.

A Free Opinion as to the probable patentability of an invention will be readily given to any inventor furnishing us with a model or sketch and a brief description of the device in question. All communications are strictly confidential. Our **Hand-Book** on Patents will be sent free on request.

Ours is the **Oldest** agency for securing patents; it was established over sixty-five years ago.

MUNN & CO., 361 Broadway, New York
Branch Office, 625 F St., Washington, D. C.

INDEX OF INVENTIONS

For which Letters Patent of the United States were Issued for the Week Ending

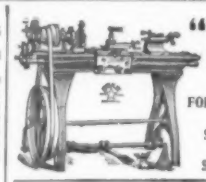
April 12, 1910,

AND EACH BEARING THAT DATE

[See note at end of list about copies of these patents.]

Abdominal retractor, J. E. Sparks 955,006
Abrasive material and making it, L. E. Saunders 954,766
Accoustic apparatus diaphragm, W. Burstyn 954,715
Advertising apparatus, rotating, G. Lefevre. 954,525
Advertising device, A. Marks 954,752
Advertising device, W. Molemar 954,755
Advertising device, J. A. Dossett 954,942
Airship, G. H. Brekke 955,049
Alarm apparatus, J. E. Hall 954,675
Alfalfa mills, feeder for, W. Miks 955,090
Aluminum and titanium, composition of matter containing oxids of, L. E. Saunders 954,767
Aluminum, silicon, and titanium and making same, composition of matter containing oxids of, L. E. Saunders 954,768
Ambulance, W. von Oettingen 954,760
Anchor, ground, H. Fuchs 954,519
Anchor storage, N. D. Powell 954,882
Anesthetics, apparatus for administering, C. A. Hollett 955,121
Animal cleaning or dehairing machines, beater arms for, A. Hannaford 954,431
Animal trap, J. Jackson 955,075
Armature winding, F. Conrad 954,614
Ash pan, dumping, T. J. Hudson 955,072
Asparagus knife, R. F. Bresnahan 955,050
Bag fastener, J. S. Isidor 954,735, 954,736
Bait, artificial, J. E. Pflueger 954,691
Baking pan, E. Wing 955,053
Bale tie machine, J. A. Scharf 955,000
Barrel cleaning apparatus, S. Kellogg 954,811
Barrel heater, H. Grahn 954,623
Bath hopper, foldable, R. D. Knickerbocker. 954,972
Bearing, antifrictional, A. Pouten 954,464
Bearing for pulleys, self-oiling, C. M. Wheaton 954,837
Bearing, roller, G. A. Brewer 954,922
Bearing, self-contained roller, C. S. Lockwood 954,529
Bearing, self-oiling, C. M. Wheaton 954,830
Bearings, vibration reducer for shaft, L. N. Kelley 954,852
Bed construction, J. F. Gail 954,620
Bed frame, J. Duke 954,563
Beer and the like, apparatus for chilling and carbonating, H. F. Stanley 955,108
Beet lifter, A. Bourdeau 954,610
Belt guide, J. E. Fisher 954,618
Billiard table, convertible soft, J. S. McIntire 954,757
Binders, treating adhesive, J. D. McLaurin. 954,644
Bland feeding mechanism, J. E. Abrams 955,112
Bleaching agents, apparatus for storing, diluting, and applying, J. A. Wesemer .. 954,835
Blowpipe, F. L. McGahan 955,092
Blowpipe for welding metal, P. J. Griffin .. 955,064
Boat, folding, J. Vaghi 955,020
Boats, device for conning submarine, L. Y. Spear 954,707
Bobbin holder, R. S. Matteson 955,088
Boiler. See Downdraft sectional boiler.
Boiler bottom, D. J. Lahay 955,084
Boiler safety appliance, steam, E. Roth 954,704
Bolt, N. W. Trautner 954,481
Bolt and latch lock, P. Duret 954,427
Bonded article and making same, G. N. Jeppson 954,809
Book, conductor's train, J. C. A. Crane 954,853
Book mark, G. H. Brooks 955,114
Boot and shoe, MacFarland & Baker 954,749
Bottle capping machine, J. A. McAnulty 954,685
Bottle cooler, H. A. Tompert 954,598
Bottle, nursing, H. C. Dunfee 954,564
Bottles or other receptacles, means for stoppering or sealing, H. W. Johnson 955,079
Bottles, stopper lock for, J. L. Peters 955,099
Bottling machine, A. Schneider 954,824
Box, Horton & Choate 954,676
Box for vials, flasks, and similar objects, Bacil & Girard 955,041
Box lining machine, W. A. Joplin 954,750
Brick handling machine, R. C. Penfield 954,594
Bricks, composition of matter for the manufacture of building, H. D. Phillips 954,693
Bricks, composition of matter for the manufacture of road or street, H. D. Phillips 954,694
Brush, J. L. Erskine 955,061
Brush, scrubbing, Raymond & Baker 954,542
Bucket, bottom dumping, G. L. Stuebner 954,493
Burner, D. O. Rose 954,702
Butter pat making device, F. W. Billings .. 954,608
Button setting machine, C. Romm 954,821
Cabinet for sheet fabrics, storing and dispensing, J. E. Hart 954,801
Can bodies, etc., machine for slitting or trimming blanks for, C. W. Graham ... 954,622
Can centering and truing device, Krummel & Taliaferro 954,976
Car construction, H. H. Adams 954,908
Car door operating mechanism, C. J. Rehlin. 954,698
Car, dumping, C. P. Astrom 954,660
Car fender, J. D. Marvil 954,754
Car fender, F. Patsky 954,762
Car fender, street railway, B. Murphy 953,874
Car, ladle, C. P. Astrom 954,561
Car pneumatic door device and brake release mechanism, combined street, Rowntree & Spencer 954,592
Car replacer, H. H. Harrison 954,809
Car transferring device, O. H. Baker 955,039
Car ventilator, R. E. Frame 954,569

Carr, automatic registering device for street, L. J. Dugan 954,725
Cars, dirt spreading attachment for, E. McCormick 954,536
Cars, safety controlling device for street, E. D. White 954,710
Carbon remover, R. Zastrow 954,491
Carburetor, A. M. Wolf 954,488
Carburetor, A. Howarth 954,630
Carburetor, R. O. Craven 954,785
Carburetor, A. M. Wolf 954,905
Card dealing machine, R. A. Berger 955,044
Carriage and sleigh, combined baby, D. H. Huff 954,631
Carrier, Bee Change carrier,
Cash register, F. H. Trevellian 955,016
Cellulose formate, S. von Kapff 955,082
Cement brick machine, Buckeye & Buerlein 954,418
Cement, manufacturing, R. Tornay-Schosberger 954,658
Cement or concrete fence post, H. W. Underwood 954,831
Cement or concrete fence post mold, H. W. Underwood 954,830
Cement supplying apparatus, N. Marshall 954,753
Chain, conveyer, C. W. Hombach 955,070
Chain drive, sprocket, T. A. Edison 954,789
Change carrier, C. G. Palmer 954,761
Check controlled manually operated lock, A. W. Riggs 954,700
Cheese cutter, C. M. Wright 954,602
Chenille, G. Hedrich 954,570
Churn, G. T. Eyland 955,074
Cigar holder for hats, W. W. Katterhein-rich 954,740
Cigar lighter, C. Binger 955,058
Cigarette cutting machine, continuous, H. Bilgram 955,113
Cigarette packing machine, H. Bilgram 954,917
Circuit controller, S. Cabot 954,716
Clamp, E. E. Koken 954,524
Clean cut fitting, C. Colombo 954,852
Clock synchronizing attachment, P. E. Burns 954,714
Closet bend or fitting, W. E. Young 954,604
Closet rinsing apparatus, R. Stickdorn 954,899
Clothes cleanser, R. W. Scott 955,106
Clutch, driving, D. S. Beard 954,774
Coal, mechanism for feeding pulverized, W. R. Dunn 954,944
Coal screening apparatus, A. W. Crawford 954,935
Coal washing machine, J. A. Montgomery 954,986
Coin holder, E. Reizenstein 954,589
Compasses, P. Bogner 954,885
Composing machine, typographical, Pearce & Billington 954,459
Concrete bridge, reinforced, J. E. Mandeville 954,750
Concrete, composition of matter for, H. D. Phillips 954,692
Concrete construction, F. Melber 954,983
Concrete construction, trussed bar for reinforced, P. Stragiotti 954,900
Concrete construction, waterproof, F. P. Lawrence 954,814
Concrete culverts, cisterns, and the like, adjustable frame for building, W. Prillman 954,696
Concrete structures, reinforcement for, C. Bressman 954,925
Concrete wall, B. N. Pettigrew 954,690
Concrete walls, reinforcing metal yoke for hollow, W. E. Nelson 953,877
Confinement chair, E. C. Schortmann 954,474
Controller, mechanical, H. W. Forslund 954,598
Convertible chair, A. G. Shaw 954,594
Conveyer apron, E. G. Clymans 954,781
Conveyer, chute, Snell & Hand 954,895
Cooling system for packing houses, T. Fellows 954,664
Copying device, manifold, A. R. Sampson 954,822
Core box, J. Kraus 954,442
Cores for pipes and other hollow castings, machine for making sand, J. R. McWane 954,876
Cotton chopper, T. H. Ellis 954,566
Cotton chopper, L. A. Lang 955,085
Cotton chopper, M. Caldwell 955,115
Couch, convertible, Old & Bennett 954,579
Counting-off machine, G. F. McAdams 954,875
Couplings, guiding and locking means for M. C. R., W. T. Van Dorn 955,022
Crate, F. L. Weigand 955,027
Crate, folding poultry, J. W. Lightfoot 954,981
Crate, shipping, N. H. Carter 954,613
Crib and play pen, folding, H. Janes 955,076
Culvert pipe, corrugated metal, A. G. Felker 954,673
Cupram monium solutions, producing, V. E. Meets 954,984
Current motor, J. L. Hawley 954,626
Current transformer, alternating, H. A. Keip 954,518
Curtain catch, vestibule, A. Lian 954,866
Curtain holder and releaser, Bukey & Davis 955,051
Cut-off, spout, E. J. Schweig 954,891
Cutter head setting and gaging device and stand, Blood & Osteman 954,712
Cutting machine, Slaybaugh & Aff 954,705
Damper and air regulator, E. A. Midgley 954,643
Damper regulator, Ambruster & Peck 954,493
Desiccating apparatus, I. S. Merrell 954,451
Dish washer, H. Ostrom 954,879
Dish washing machine, G. M. Cram 954,615
Disinfecting appliance, M. Breifuss 954,426
Dispensing can or vessel, A. K. Sween 955,013
Display case, folding, D. Weinstock 954,834
Display holder, hat, O. Justus 954,678
Display truck, J. L. Tandy 955,014
Disguising graining effects, device for, F. M. Clapp 954,928
Distilling hydrocarbon oils, apparatus for, J. S. Lang 954,575
Ditching machine, D. E. Howatt 954,677
Dolt, nautical, T. W. Sanford 954,544
Door fastener, J. E. Hawkins 954,432
Door fastener, A. M. Hoss 954,806
Door hanger, M. Cossey 954,933
Door, vault and strong room, T. S. Sulvey 954,547
Dough brake, Day & Ward 954,937
Downdraft sectional boiler, E. M. Bosley 954,417
Draft regulating device, A. A. Specht 955,007
Draft tube, K. G. Stenberg 954,898
Drainage tube, G. E. Andrews 954,494
Drawing instrument, mechanical, V. M. Spunar 954,470
Drier or oven, J. Koller 954,743
Drinking vessel, J. H. Landwehr 954,978
Driving mechanism, friction, J. W. Lambert 954,977
Dust collector, pneumatic, F. C. DeValiant 954,938
Dye and making same, anthracene, Scholl & Isler 955,105
Dye and making same, azo, Herzberg & Rouss 955,088
Dye and making same, red azo, Herzberg & Rouss 954,960
Dye and making same, yellow, Julius & Fussenegger 955,080
Dye, extracting, G. J. Fowler 954,949
Elastic tread, C. J. Bailey 954,413
Electric conduits, connection box for, J. E. Graybill 954,954
Electric furnace product and making same, Jeppson & Saunders 954,808
Electric induction furnace, C. W. Soderberg 954,827
Electric machinery, winding for, H. & E. Rosenberg 954,468
Electric oscillations, instrument for detecting, J. A. Fleming 954,619
Electric receptacle, N. Marshall 954,642
Electric switch, J. G. Peterson 954,462
Electric switches, terminal for push button, N. Marshall 954,448
Electric vapor apparatus, means for suppressing the resistance of the negative electrode flame in, P. C. Hewitt 954,434
Electric ventilator, W. Mehlbese 955,089
Electric wire terminal, A. R. Mosler 954,872
Electric wires, combined junction and terminal box for, F. C. Woods 954,842
Electrical cut-out, F. J. McDonald 954,537
Electrical distribution system, W. A. Turbayne 954,599
Electromagnet, alternating current, L. Larsen 954,745
Engine, See Gas engine.
Engine, F. Manz 954,982
Engine cooling device, gas, J. A. Charter 954,780
Engine starting device, J. W. Tudor 955,017
Engines, air and gas mixer for explosive, G. L. Fogler 954,597
Envelop fastener, E. B. Stimpson 954,479
Envelop opener, O. A. Reed 954,884
Excavator bucket, J. C. Crenshaw 954,936
Excavator, J. S. Henderson 954,803
Excavator, earth, J. F. S. Kirby 954,521
Exercising apparatus, J. Ertl 954,790



"Star" Foot and Power Screw Cutting Automatic Cross Feed Lathes

FOR FINE, ACCURATE WORK

Send for Catalogue B.

SENECA FALLS MFG. CO. 695 Water Street, Seneca Falls, N. Y., U. S. A.

Engine and Foot Lathes

MACHINE SHOP OUTFITS, TOOLS AND SUPPLIES. BEST MATERIALS. BEST WORKMANSHIP. CATALOGUE FREE

SEBASTIAN LATHE CO., 120 Culvert St. Cincinnati, O.

Veeder Counters

to register reciprocating movements or revolutions. Cut full size.

Booklet Free.

Price $1.00

VEEDER MFG. CO. 18 Sargeant St., Hartford, Conn.

Cyclometers, Odometers, Tachometers, Counters and Fine Castings.

Represented in Great Britain by Marey & Co., Limited, 6 City Road, Finsbury Square, London, E. C.; France, by Marey & Co., Limited, 107 Avenue Parmentier, Paris; Germany, Austria-Hungary and Scandinavian Countries by Louw. Louwa & Co., Hutten-Strasse 17-20, Berlin.

THIS GRINDER

Has no pumps, no valves. No piping required to supply it with water. Always ready for use. Simplest in construction, most efficient in operation. *Price will interest you*

W. F. & JNO. BARNES CO., Established 1872. 1999 Ruby St., Rockford, Ill.

Aluminum Can Be Soldered

to itself or to other metals. We guarantee the joint to be stronger than the original metal.

SAMPLE BAR, POSTPAID, 50 CENTS

STANDARD LEATHER WASHER MFG. CO., Newark, N. J.

6 HORSE POWER COMPLETE 1,283 Cylinders, 3 to 30 B.P. $94 Absolutely Guaranteed by a RESPONSIBLE concern.

Write for complete catalog today—tells all about how these high grade motors are built in the **largest plant in the world** devoted exclusively to the manufacture of 2-cycle motors.

GRAY MOTOR CO., 11 LEIB ST., DETROIT, MICH.

Isolated Plant Magazine will open your eyes to the ways and means of effecting large Electric Light and Power Economies.

Every building owner, architect, agent, superintendent, chief engineer and power user will find each month's issue worth in dollars and cents the full year's subscription price of $1. Send $1 today. If you don't like the first issue, say so, and we'll refund the dollar.

47 West 34th Street, New York

ELECTRO MOTOR. SIMPLE, HOW TO make.—By G. M. Hopkins. Description of a small electric motor devised and constructed with a view to assisting amateurs to make a motor which might be driven with advantage by a current derived from a battery, and which would have sufficient power to operate a foot lathe or any machine requiring not over one man power. With 11 figures. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 641. Price 10 cents. To be had at this office and from all newsdealers.

For Pumping, Cream Separators, Churns, Wash Machines, etc. FREE TRIAL. Ask for catalog—all sizes

GILSON MFG. CO. 308 Park St. Port Washington, Wis.

EARN GOOD MONEY as a WATCHMAKER

Engraver and Optician. We teach you quickly, at small expense. Good watchmakers are always in demand, at liberal salaries.

Send for free circular B.

WALTHAM HOROLOGICAL SCHOOL, Waltham, Mass. (Oldest, Most Up-to-date and Best-Equipped in U. S.)

Don't Throw it Away

Does Your Granite Dish or Hot Water Bag Leak?

USE MENDETS A PATENT PATCH

They mend all leaks in all utensils—tin, brass, copper, graniteware, hot water bags etc. No solder, cement or rivet. Anyone can use them; fit any surface; two million in use. Send for sample pkg. 10c. Complete pkg. assorted sizes, 25c postpaid. Agents wanted.

Collette Mfg. Co., Box 192 Amsterdam, N. Y.

Wireless Telegraph Apparatus of the greatest reliability, in complete sets, or separate instruments for private or commercial use, are described in catalog G.

CLAPP-EASTHAM CO. 731 Boylston St., Boston, Mass.

RELIABILITY

PHOTOGRAPHERS SAVE 30 PER CENT

Every Photographer, the novice, amateur, professional, can save 30 per cent. on something indispensable. YOU WILL HAVE TO HAVE IT SOONER OR LATER. This valuable tip will be given by us to get you acquainted with the best photographic magazine. Your name and address will bring to you sample copy and the full information.

AMERICAN PHOTOGRAPHY

1341 Beacon Bldg., Boston, Mass.

INSECT PESTS IN HOUSE AND STORE.

(*Continued from page 344.*)

sects. My reason in mentioning it in this place, however, is that it is said to be capable of making a regular tapping noise which is audible to mankind. Its extremely small size, and the softness of its body, make it difficult to understand how this noise can be produced; but I give the fact on the authority of an eminent observer. Before leaving the boring beetles of the genus *Anobium* mention should be made of the species known popularly as the bread or paste beetle (*A. paniceum*). It is very common in houses and possesses a voracious appetite. Moreover, it cannot be termed "dainty," for it appears to eat almost anything which it encounters, from dry wood to Cayenne pepper, although it seems especially to appreciate bread, biscuits or other concoctions in which flour and water are the chief ingredients. It is often most destructive to the stored goods of merchants, as well as to the stocks of grocers and chemists. Two of the photographs here reproduced show samples (1) of marcaroni and (2) ginger riddled by this pest. I have also known it to feast upon dry capsicums. This insect, too, has rendered almost worthless a stock of boots and shoes which, before the advent of the pest, had been valued at many thousands of pounds. This happened in South Africa, although reports of damage have also been received from manufacturers in other parts of the world. Paste had been used in making the boots, to fasten the linings and leather together, and in devouring their favorite dainty—i. e., the paste—the beetles had perforated and damaged the leather so as to reduce it literally to rags.

The so-called paste beetle, moreover, is probably the worst offender among the insect enemies of books. It gets into old libraries, and its grubs gnaw the edges of the pages and drill their tunnels from cover to cover of the volumes. The photograph reproduced here will give some idea of the serious damage of which this pest is capable, and may stand as a warning to all lovers of "first editions" and other costly tomes. In times past many valuable books have been rendered almost worthless in this manner, while there is a case on record in which twenty-seven folio volumes, standing side by side, were perforated in a straight line by one *Anobium* grub or "book worm." Its tunnel was so perfectly drilled that it was possible to pass a string from one end of it to the other, and thus lift up the entire set of twenty-seven volumes at once. These grubs have also been known to tunnel through sheet-lead when this has come in their way, a fact which bears witness to the hardness of their heads and the strength of their jaw muscles.

Probably few people, save those who dabble in natural history, are aware that a small moth—one of the *Micro-lepidoptera*—is held in dread by wine merchants and cellarers in many parts of the world. Large numbers of wine cellars are affected by this pest, and its depredations represent an annual loss which must run into many thousands of pounds. Of course, the moth itself is harmful only as the progenitor of hungry caterpillars. But it appears to have renounced the traditional air-and-sunlight habits of moths in general, and to frequent by choice the gloom of subterranean vaults. Here the female insect lays her eggs upon the corks of wine bottles, and when the tiny caterpillars hatch they burrow into the substance of the cork, just as the caterpillar of the big goat moth burrows into the heart of an oak or an apple tree.

The presence of the wine-cork pest is manifested in an accumulation of cork-dust and refuse ("frass") round the exposed portions of the cork. This accumulation may be seen in one of the pictures herewith. Later, if the grubs are numerous, the cork is so tunneled that the wine escapes—this being the so-called "ullage" of wine. Sherry, madeira and champagne corks are attacked indiscriminately; and even when the corks are not so badly tunneled as to produce ullage, the wine usually becomes tainted, and is thus rendered valueless.

Even new corks in store are sometimes injured by the caterpillars of a moth, though in this instance the taste appears to be a recently acquired one, for the insect in question is really the fig moth (*Ephestia ficuella*). As its name implies, its caterpillars feed normally on dried figs. So prevalent is this pest that it may almost be described as a common object of the dessert table, for few figs, save the most recently imported, are quite free from the small white grubs of this moth. In passing, it may be remarked that this insect is also known to attack cocoa beans.

But while the fig moth accomplishes no small amount of damage, its depredations are far less serious and widespread than those of its relative, the codlin moth. This is another of those insects which come unbidden with the dessert. I am able to reproduce a photograph which gives a good idea of the damage done to an apple by this pest. The reader will observe that the caterpillar confines its attack chiefly to the center of the fruit, where it feeds upon the pips and core. Sometimes a most delicious-looking apple, apparently perfectly sound, proves to be full of rottenness on being cut open. It may be that the reader is wondering how the caterpillar got into the apples, just as George IV. is said to have wondered how apples got into dumplings. The facts of the case are as follows: The little codlin moth flies about at dusk in orchards just at the season when the young apples are forming. She visits one fruit after another, and lays an egg in the "eye" of each. When the egg hatches, the minute caterpillar burrows into the heart of the apples, making a hole so small that it is unnoticeable when the apple attains its full size. Thus is provided the phenomenon of a hungry grub consuming the interior of an apple which, to all appearances, seems to be as inviting as any of its neighbors.

When the grub is full fed it bores its way out of the apple, and eventually spins a cocoon of rough silk in a crevice in the tree trunk, or on a neighboring fence in which it changes to a pupa. Despite its name, the codlin moth does not confine its attention to any particular variety of apple, but attacks all the best kinds indiscriminately. It has attained a very wide geographical range—having followed the apple tree, so to speak, all over the world. It has called forth the maledictions of apple-growers in France, Germany, Great Britain, Canada, Australia, and Tasmania, as well as in the United States. In Tasmania it has been so troublesome that the legislature has thought it necessary to pass an act for its suppression.

Tobacco merchants and manufacturers are sorely tried at times by the activities of a beetle known to science as *Lasioderma testacea*. This insect has acquired the habit of feeding upon stored tobacco. It is especially injurious to cigars and cigarettes. Photographs showing examples of its work are reproduced herewith. Yet another beetle attacks nutmegs, coffee berries, and certain kinds of spices. The annexed photograph shows us a sample of Java coffee, some fifteen years old, almost every berry of which has been bored by this pest. Fortunately the attacks of this beetle do not affect the quality of the coffee when ground. Nevertheless, it is quite certain that when buying old coffee one buys also a certain amount of ground-up beetles—and this fact may be displeasing to many. Yet if one were to avoid food or beverages simply because one doubted their freedom from contamination by insects, one would eat and drink very little indeed!

I doubt if there is a man or woman living who has not eaten—of course, quite unwittingly—very many examples

of the weevil known as *Calandra granaria*. This is one of the most injurious pests with which corn merchants have to contend, despite the smallness of its size. I am able to reproduce a magnified photograph showing a few grains taken from a sample of wheat which had been attacked by *Calandra*. The sample fairly represents the condition of a whole cargo of wheat which was rendered practically valueless during a protracted voyage across the Atlantic. In the case of this one shipload, the loss caused by this beetle amounted to many thousands of pounds, while costly litigation ensued. Of course, an instance of this kind is somewhat exceptional. Nevertheless, the corn weevil imposes a constant tax upon stored grain, while it is no exaggeration to state that every granary is infected by this pest. Thus, countless millions of the insects must be ground with the wheat into flour each year; and the weevils must, therefore, form an actual part of the bread which we eat.

Another corn pest is a small moth which is especially injurious to stored flour. Its scientific name is *Ephestia kuhniella*. It is the scourge of the Mediterranean ports, where it is impossible to estimate the extent of the damage which it accomplishes. In November, 1887, *Ephestia* made its appearance in East London—having been brought thither, no doubt, in ships. Its presence was first detected in a warehouse at the docks. Unluckily, over a thousand tons of flour were stored in close proximity; and, although all possible efforts were made to save it, the insects multiplied with such extraordinary rapidity that the trouble taken was of no avail.

Buggy-top Canopies for Launches.

Experiments have just been completed by the naval constructors with a view to the adoption of a new type of canopy for use on the naval launches.

When the launch of the U. S. S. "Minnesota" was lost in Hampton Roads with several midshipmen on board about a year ago, the fatality was attributed to the fact that the canvas covering used as a protection against the weather was fastened in such a manner that it could not be quickly released, and the men were hopelessly imprisoned in the sinking boat. This fact led to much criticism of the type of canopy used, and the steam launches came to be known as "death traps."

The constructors have been working on a design intended to overcome that difficulty, and several types of canopies were tested on launches of the Atlantic fleet within the last two or three months.

The result of these tests is the adoption of what is commonly known as the buggy-top canopy. This is made of canvas, and is attached to rods in such a manner that the canopy can be easily adjusted and folded out of the way, similar to those used on automobiles.

While the new style of canopy will not be as durable as the old-fashioned one, and will not afford the same protection against wind and rain, in case of a collision, and the launch is in danger of being sunk, it can be quickly put out of the way and not endanger the lives of the occupants of the boat.

By microphotographic methods, the vibrations in an incandescent filament, due to the expansion and contraction caused by the passage of an alternate current, have been recorded. An arc lamp was used as the source of light for photographic purposes, and if the arc is fed from the same alternator as the incandescent filament, the vibrations are seen from the plate to synchronize with the rise and fall of the alternating pressure. With a 100-candle-power osram lamp, supplied with alternate current at 50 alternations, a slight humming noise was perceptible even at a distance of three yards. The experimenter considers that this may be a cause contributing to the shorter life of a metallic filament on alternate current.

THE "BEST" LIGHT

The perfect light for every purpose. Better than electricity—cheaper than kerosene. Makes it possible for every one to be independent and own their own light works. If you can afford kerosene lamps you can afford the "Best" Light. The saving in expense quickly pays its cost. Every lamp guaranteed. Catalog free. Agents wanted. Write to-day.

The Best Light Co.
87 E. 5th St.
Canton, O.

Remoh Gems

Looks like a diamond—wears like a diamond—brilliancy guaranteed forever—stands filing and fire like a diamond—has no paste, foil or artificial backing. 1-30th the cost of diamonds. Set only in solid gold mountings. A marvelously reconstructed gem. Not an imitation. Guaranteed to contain no glass.

$7.20 SOLID GOLD RING 1 CARAT LADIES HIGH SET SOLITAIRE RING

$6.25 SOLID GOLD STUD 1 CARAT SOLID GOLD SCREW STUD

$12.15 SOLID GOLD RING 1/2 CARAT SOLID GOLD HEAVY SHANK SETTING

Any article sent on approval, prepaid, on receipt of price, or by express C. O. D., subject to examination upon receipt of 50c. to show good faith. Money back if not satisfactory. Write for catalog. It's free.
Remoh Jewelry Co. 453 N. Bdway, St. Louis

FOR 149 YEARS
A. W. FABER has made the highest grade of lead pencils
"CASTELL"
DRAWING, COPYING, INK PENCILS
represent that acme of perfection that can be obtained only by experience and long effort to produce the finest it is possible to manufacture. Sold by all stationers and dealers in artists' and drawing materials. Sample will be sent you on receipt of 10c.
A. W. FABER, 49 Dickerson Street, Newark, New Jersey

Copyright 1909 Life Publishing Company

ILLUSION

This subject is a facsimile reproduction in the colors of the original drawing.

It is mounted for framing 14 x 17 inches and costs $1.00.

LIFE PUBLISHING COMPANY
17 West 31st Street, New York

NOW READY
THE SCIENTIFIC AMERICAN HANDBOOK OF TRAVEL
With Hints For the Ocean Voyage
FOR EUROPEAN TOURS
AND A PRACTICAL GUIDE TO LONDON AND PARIS
By ALBERT A. HOPKINS
Editor of Scientific American Reference Book
500 PAGES 500 ILLUSTRATIONS FLEXIBLE COVER, $2.00
FULL LEATHER, $2.50, POSTPAID

AT last the ideal guide, the result of 20 years of study and and travel, is completed. It is endorsed by every steamship and railroad company in Europe. To those who are not planning a trip it is equally informing. Send for illustrated circular containing one hundred questions out of 2,500 this book will answer. It is mailed free and will give some kind of an idea of the contents of this unique book, which should be in the hands of all readers of the SCIENTIFIC AMERICAN as it tells you exactly what you have wanted to know about a trip abroad and the ocean voyage.

WHAT THE BOOK CONTAINS

500 Illustrations
6 Color Plates
9 Maps in pocket
Names 2,000 Hotels, with price
All About Ships
"A Safer Sea"
Automobiling in Europe
The Sea and Its Navigation
Statistical Information
Ocean Records
400 Tours, with prices
The Passion Play
Practical Guide to London
Practical Guide to Paris

MUNN & COMPANY, Inc., Publishers, 361 Broadway, New York, N. Y.

THE ANNUAL SMALL HOUSE NUMBER
OF
American Homes and Gardens

THE May Number of American Homes and Gardens will be devoted to the small house, its building, its decoration, and its furnishing. This issue will contain a vast amount of information for the prospective home-builder. Special attention will be given to the inexpensive small house, which is the most numerously erected dwelling in America, and the type of house that at once excites the widest interest and offers the richest field for suggestive helpfulness.

Various departments conducted by specialists add greatly to the value of this number and the aim has been to bring out the charm of the simple beautiful things which contribute to domestic comfort and happiness, solely for the purpose of solving the problems which confront the house-owner but which cannot be explained without the assistance of a competent expert. It will tell him how to select the country site, how to place the house upon it, the style of architecture in which the house should be designed, how the various rooms of the house should be planned, the material of which it may be built, the kind of plumbing fixtures to be used, the choice of hangings for the walls, doors and windows, appropriate furniture for the various rooms of the house, and how to lay out the grounds about the house as well as to the planting of them. Beside these departments, the magazine will contain a host of articles that must inevitably stimulate the desire for home improvement.

The Moderate House from the Atlantic to the Pacific.
How to Build a Pergola and a Garden Seat.
The Small Kitchen of To-Day.
The Out-of-door Living Room.
Some California Bungalows.
Planning the Small Garden.
Decorations and Furnishings for the Home.
Automobiling.
Pottery Making for the Amateur.
Furniture for the Arts and Crafts House.
The Use of Cement in the Building of the Suburban House and Garage.
Garden Notes.

The price will be 50 cents. Those now subscribing for American Homes and Gardens will receive it at the regular rate. Subscription price $3.00 a year.

MUNN & COMPANY, Inc., Publishers, 361 Broadway, New York, N. Y.

Exploder, delayed action electric, R. L. Oliver	954,689
Extension table, C. K. Hough	954,716
Fabric sponging and finishing machine, A. J. Hamma	954,861
Fabrics, tool for patterning piled, M. Urbartsek	954,483
Fastening device, F. H. Richards	954,793
Faucet, W. B. M. Bashlin	954,907
Faucet, T. G. Kus	954,744
Feed hoppers, cut-off device for, G. P. & P. D. Burke	954,850
Feed receptacle, C. P. Flanagan	954,948
Feeder, horse, J. C. Snyder	955,005
Filter, H. Pond	954,647
Fire hose carrier, H. L. Jenkins	954,807
Firearm, M. F. Smith	954,654
Firearm, A. H. Stockwell	954,657
Firearm, C. A. Young	954,663
Firearm, J. C. White	954,904
Firearm, automatic repeating, O. H. J. Krag	954,441
Firearms, breech closing mechanism for automatic, C. L. Ross	954,543
Fish hook, M. B. Eckhardt	954,788
Floor scraper, J. F. Weber	954,485
Flower pot, H. Klemm	954,440
Fluid compressor, Annable & Fitz Gerald	954,695
Fluid indicator, E. A. Cramer	954,423
Fly paper, sticky, C. J. Ross	954,887
Flying machine, etc., A. O. Hagstedt	954,733
Flying machines, means for steering, Koegler & Steltzer, Jr.	954,574
Folding machine, E. H. Brown	954,775
Food hopper, J. A. Jocoy	954,968
Frame. See Bed frame.	
Furnace heating and ventilating, fresh air injector for, O. Nelson	954,989
Fuse cap, miner's, C. F. Sperr	954,595
Fuse holder for single pole circuits, multiple, H. Wheeler	954,838
Gallocyanins and making same, derivatives of, C. Barbezat	955,040
Game apparatus, E. H. Heath	954,627, 954,628
Game apparatus, bowling, R. F. Downey	954,943
Garbage evaporator and crematory, F. L. Decarie	954,855
Garment, A. L. Dautrey	955,055
Garment hanger support, G. M. Blandford	954,920
Gas and electric fixture, combined, A. I. Schwinger	955,002
Gas engine, W. L. Morrow	954,577
Gas safety device, R. H. Cowdrey	954,783
Gas separator, W. McArthur	954,454
Gases, apparatus for treating burner, J. B. F. Herreshoff	955,007
Gear and brake mechanism, variable, J. Archer	954,664
Gear, variable speed, J. Archer	954,665
Gearing, differential locking, E. Luckwill	954,748
Gearing for metal working machines, Lucas & Green	954,639
Gearing, multiple speed driving, N. A. Diderjean	954,672
Gearing, speed, J. Morgan	954,987
Gearing, transmission, A. J. Morse	954,453
Glass forming machinery, C. F. W. Suess	954,801
Glass making machine, P. Henry	955,060
Glass, method of and apparatus for making wire, P. J. Sr., P. J. Jr., & F. Guyaux	954,956
Glass, mode and means for manufacture of sheet, F. M. Oppermann	954,457
Gold washer, dry, G. W. Palmer	954,580
Gopher trap, A. F. Renken	954,996
Governing mechanism, M. M. Pearson	954,646
Governor, engine, L. E. Hunt	955,073
Grading machine, road, C. W. Horton	955,071
Grading machine, road, P. J. Jewett. reissue	13,101
Grain stripping machines, adjustable comb for, E. A. A. Pavy	955,008
Grass catcher, C. K. Hann	954,569
Grate bar, J. S. Wilson	955,031
Grinding machine, hay, D. Prilliman	954,540
Gum breaking machine, H. Y. Armstrong	954,773
Gun, automatic, G. Hammond	954,797 to 954,799
Gun lock, M. Taylor	955,015
Gun, recoil loading, C. A. T. Sjogren	954,546
Hammock, baby, W. H. Connery	954,421
Hand strap, R. L. Douglass	954,723
Handle. See Switch handle.	
Harness hames, J. Compton	954,499
Harrow, J. R. Naylor	954,759
Harvester, E. Jeschke	954,438
Hasp or catch, spring, J. S. Isidor	954,737
Hat hanger, H. A. Koett	954,974
Hat holder, G. A. Schobert	954,472
Hat matrix, L. Stevens	954,478
Hat pin, safety, B. Brownstein	954,776
Hat pressing machine, H. C. Baron	954,495
Hat shield, J. H. Townsend	954,708
Hauling and hoisting apparatus, H. L. Phillips	954,881
Hay handling mechanism, M. H. Madsen	954,808
Hay rake, C. E. White	954,903
Head rest bar, L. F. McNeel	955,034
Headlight attachment, F. J. Pfister	954,810
Heating device, W. E. Frost	954,428
Heating system, H. C. Mallory	954,532
Hedge trimming machine, M. Bielenberg	954,667
Heel, boot and shoe, S. Peterson	955,100
Hinges, protecting device for strap, F. J. Proehinska	954,883
Hook and eye, C. B. Patterson	954,478
Horseshoe attachment, emergency, A. Roth	954,469
Hub, vehicle, P. A. Eddleman	955,060
Hydraulic indicator, Fryett & Botten	954,727
Ice cream disher, H. Bieder	954,498
Ice manufacturing apparatus, J. F. Rogers	954,467
Index system, E. A. Bagby	955,038
Indicator. See Hydraulic indicator.	
Induction furnace, K. A. F. Hforth	954,804
Innersole, G. E. Rollins	955,104
Insect destroying bomb, D. M. Rogers	954,591
Insulating device, J. Steynis	954,597
Insulator, A. L. Stadermann	954,598
Insulator, C. C. Hardin	955,065
Insulators, machine for threading porcelain, G. F. Young	954,490
Integrating device, H. L. Merrick	954,809
Integrating device, H. L. Merrick	954,876
Iron, vulcanizing, W. L. Dinsmoor	954,425
Ironing board, W. F. Cash	955,052
Ironing board, adjustable, J. G. Kirkpatrick	955,083
Ironing table, C. H. Ellis	954,565
Jack and restoring trip, combined, E. J. Grenier	954,624
Joint. See Lamp joint.	
Joint closure, Cable & Bailey	954,668
Key fastener and key ring, combined, J. W. Clark	954,929
Kiln, M. Ittner	954,953
Knapsack and the like, A. Schumacher	954,825
Knife. See Asparagus knife.	
Knitting machines, automatic cleaner for latch, E. C. Cook	954,932
Label follower mechanism, F. O. Woodland	954,841
Labeling machine, bottle, A. N. Ketterer	954,635
Ladder round support, W. J. La Fleur	954,813
Lamp, F. A. Cameron	954,779
Lamp, electric, R. M. Newbold	954,878
Lamp, kerosene, B. F. Rochrig	954,950
Lamp socket, incandescent, H. R. Sargent	954,823
Lamp sockets, adjustable casing for electric, C. D. Platt	954,695
Lamp, trick electric pocket, A. Jedel	955,078
Lamps and sockets, lock guard for incandescent, H. Hubbell	954,963
Lamps, sign attachment for, F. J. Pfister	954,820
Land packer, A. E. Smith	954,653
Lap joint, M. R. Kester	954,520
Lard cutter, J. D. Leen	954,444
Lathe, last, M. H. Lyons	954,447
Lathe, multiple turning, A. B. Norris	954,456
Lavatory, L. E. Kenney	954,680
Lawn edger, gaged, J. C. Lindsey	954,747
Lawn edging machine, W. E. Graham	954,792
Leather trimming machine, S. Grossman	954,955
Ledger locking device, T. A. Glendinning	954,794
Lens, H. P. Alexander	954,772
Lens mounting, D. F. Green	954,515
Lever, operating, W. C. A. Henry	954,535
Lifter. See Beet lifter.	
Liquid heating and applying apparatus, O. H. Elbrecht	954,945
Liquid separator, centrifugal, C. D. Hellstrom	954,958
Loading and unloading apparatus, A. R. Holmes	954,572
Loading device, G. V. Hughes	954,632
Loading machine, portable, W. C. Zelle	954,492
Lock, F. W. Schultze	954,593
Lock, W. F. Diesel	954,720
Locomotive, electric, F. L. Sessions	954,479

Classified Advertisements

Advertising in this column is 75 cents a line. No less than four nor more than 10 lines accepted. Count seven words to the line. All orders must be accompanied by a remittance. Further information sent on request.

READ THIS COLUMN CAREFULLY.—You will find inquiries for certain classes of articles numbered in consecutive order. If you manufacture these goods write us at once and we will send you the name and address of the party desiring the information. There is no charge for this service. **In every case it is necessary to give the number of the inquiry.** Where manufacturers do not respond promptly the inquiry may be repeated.

MUNN & CO., Inc.

BUSINESS OPPORTUNITIES.

A WELL ESTABLISHED FIRM of instrument makers with branches in Europe, wishes to market under royalty some patent device, instrument, or novelty, to supplement their present line of business. Apply by letter to T., P. O. Box 773, N. Y.

Inquiry No. 8918.—For manufacturers of "Wydt's Electro-Catalytic Sparking Plug."

INVENTOR desires reliable financial aid concerning a new motive power for ships, etc. Write only. Von Kiefer, 341 Spring Street, New York.

Inquiry No. 8987.—Wanted, the manufacturers of the Van Winkle Woods & Sons, and the Weber power meters.

PATENTS FOR SALE.

FOR SALE.—U. S. patent, automatic time cut-off for individual electric lights. Needed wherever electricity is used for lighting. Will submit particulars and samples to those interested. Paul Dixon, 47 Whitehall St. Atlanta, Ga.

Inquiry No. 9014.—For manufacturers of machinery, supplies, etc., to equip a small plant for the manufacture of iridium-tipped gold nib making for fountain pens.

FOR SALE.—Patent No. 929,419. Burglar-proof sash-lock. A fortune can be made from this patent. Price very moderate. Address L. H. Grau, 2590 Pine Street, San Francisco, Cal.

Inquiry No. 9016.—Wanted, machinery necessary for an installation of a plant for refining salt by a modification of the Bessemer process.

HELP WANTED.

MECHANICAL SUPERINTENDENT to take charge of large machine shop. Apply stating experience and salary expected. Superintendent, Box 773, N. Y.

Inquiry No. 9023.—Wanted, to buy silk machines from re-reeling, twisting, doubling, to the final process of making it into clothes.

EXPERIMENTAL ENGINEER wanted, by a large manufacturing concern having technical and practical knowledge of mechanics and preferably chemistry as well. Must possess special aptitude for this character of work. Address in confidence with full particulars, including salary expected. Business Service Co., 305 Broadway, New York.

Inquiry No. 9029.—Wanted, catalogues and all information on machinery for braiding straw in manufacturing straw hats.

PARTNERS WANTED.

WANTED.—Partner to obtain principal foreign patents on improved gas engines. Device simplifies and reduces cost of operation, increases reliability and horse power of engine. Will reduce cost of manufacture 40 per cent. John C. Anderson, Terrell, Texas.

Inquiry No. 9038.—Wanted, the address of the Chipman Electric Purifying Co.

MISCELLANEOUS.

SMALL MACHINES or parts manufactured at low cost. Punch press work, tempering and case hardening a specialty. Joseph Pudlak, 215 Sydney St., Dorchester, Mass.

Inquiry No. 9042.—Wanted the address of Farney Safety Razor Co.

LISTS OF MANUFACTURERS.

COMPLETE LISTS of manufacturers in all lines supplied at short notice at moderate rates. Small and special lists compiled to order at various prices. Estimates should be obtained in advance. Address Munn & Co., Inc., List Department, Box 773, New York.

Inquiry No. 9053.—Wanted, address of firms who install plants to manufacture nitrogen.

SALE AND EXCHANGE.

FOR SALE.—Engine lathe. Our regular $75.00 lathe complete, with a face plate, two centers, wrenches and a full set of change gears to cut all size threads. Price only $45.00. L. F. Grammes & Sons, Allentown, Pa.

Inquiry No. 9055.—Wanted, address of parties interested in Log Cleaning Machines.

A LIST OF 1,500 mining and consulting engineers on cards. A very valuable list for circularizing, etc. Price $15.00. Address Munn & Co., Inc., List Department, Box 773, New York.

Inquiry No. 9060.—Wanted to buy machinery to manufacture seed corn racks.

Inquiry No. 9066.—Wanted complete outfit for export for making rice-flakes and wheat-flakes.

Inquiry No. 9073.—Wanted, machinery to manufacture cocoanut oil; also the crude material.

Inquiry No. 9074.—Wanted, to buy old model locomotives or steamboats, such as were exhibited with nickel-in-the-slot attachments in ferry-houses, etc.

Inquiry No. 9075.—Wanted, to buy small weather vanes, such as can be used as ornaments on lightning rod tops. Aluminum preferred.

Inquiry No. 9076.—Wanted, the address of parties in Canada who could make a safety razor.

Inquiry No. 9077.—Wanted, the address of manufacturers that make small articles of wood, such as checker boards, etc.

Inquiry No. 9078.—Wanted, the address of manufacturers of sewer pipe, made of fiber and asphaltum, suitable for laboratory use.

Inquiry No. 9079.—Wanted, parties to make a special steel plate rolled for "angle bars," in large quantities.

Inquiry No. 9080.—Wanted the address of parties manufacturing paste-making machinery.

Inquiry No. 9083.—Wanted, the address of firms manufacturing small beer brewing plants, from 75 to 100 gallons a day.

Inquiry No. 9084.—Wanted, the address of manufacturers of Irwin portable bath tubs.

Inquiry No. 9085.—Wanted, to buy longitudinal hollow perforated tubing.

Inquiry No. 9086.—Wanted, to buy a pine wood peeler.

Inquiry No. 9090.—Wanted manufacturers of suspender and supporters supplies, also patent adjustable bachelor buttons.

Inquiry No. 9092.—Wanted, the address of some firms who manufacture permanent lamp wicks.

Inquiry No. 9094.—Wanted address of The Thomas Arithometer Company, also Burkhart Arithometer Company.

Inquiry No. 9095.—Wanted, name and address of the manufacturer of the duplex revolving pencil sharpener.

Inquiry No. 9096.—Wanted, the address of manufacturers of spiral welded pipes, possessing great strength.

Inquiry No. 9097.—Wanted, address of makers of impulse water wheels.

Inquiry No. 9098.—Wanted, name and address of the manufacturers of the ozonizer.

Inquiry No. 9099.—Wanted, address of manufacturers of machinery for making wire cables.

Inquiry No. 9101.—Wanted, addresses of manufacturers of a dip or magnetic needle, for exploring for iron ore.

Inquiry No. 9104.—Wanted, addresses of manufacturers under the name of A. O. Co Standard.

Inquiry No. 9106.—Wanted, addresses of cotton dealers who can furnish cotton material for manufacturing envelopes.

Inquiry No. 9107.—Wanted, addresses of manufacturers of small emery files (pieces of emery in the shape of a file).

Inquiry No. 9109.—Wanted addresses of the manufacturers of the Dion Desk Clock.

Inquiry No. 9110.—Wanted to buy machinery for reducing old tin cans, so that they may become a source of revenue.

Inquiry No. 9112.—Wanted sample small dry vacuum pump about 6-inch diameter cylinder inside, high temperature metal packing.

Inquiry No. 9113.—Wanted name and address of the manufacturers of the Russell Patent Automatic Ink Well.

Inquiry No. 9114.—Wanted name and address of manufacturer of the Auto Lantern Globe. Fits all lanterns.

Inquiry No. 9115.—Wanted a machine for making pen nibs, similar to Wm. Mitchell's G. & J. nibs and Waverly nibs.

Inquiry No. 9117.—Wanted names and addresse of the manufacturers of pedometers.

Inquiry No. 9118.—Wanted, a muffler for a gasoline engine, built upon the principle of the Maxim silencer, recently brought out for use on rifles.

Inquiry No. 9119.—Wanted, name and address of the manufacturer of Zeglin bullet-proof cloth.

Inquiry No. 9120.—Wanted, the address of the Ideal Fuel Feeder Co.

Inquiry No. 9121.—Wanted, manufacturers of cut stencils for fancy work, sofa pillows, etc., and oil colors and brushes for same.

Inquiry No. 9124.—Wanted, name and address of a company in Germany making a machine to manufacture a cement and asbestos shingle and building lumber.

Inquiry No. 9127.—Wanted, address of L. Dermigny, manufacturer of a family ice machine for $10.00

Inquiry No. 9131.—Wanted, information as to how or where I could get a sample of tin ore.

Inquiry No. 9132.—Wanted, manufacturers of a gasoline traction engine with a hoisting attachment; in other words, the machine will be used as a portable stump puller to pull sassafras roots, used in making oil of sassafras.

Inquiry No. 9133.—Wanted, manufacturers of floss candy machines.

Inquiry No. 9134.—Wanted, a small hydraulic motor, capable of giving about one horse power, with a water power of 35 lbs. per square inch.

Inquiry No. 9135.—Wanted, name and address of manufacturers of the Parshall Compressed Air Ice Machine.

Inquiry No. 9136.—Wanted, the name and address of a skunk raising farm.

Inquiry No. 9137.—Wanted, a device that will braid leather strips for horse whips.

Inquiry No. 9138.—Wanted, the address of manufacturers of machines capable of forming a number (12 or more) of pieces of paste about 36 mm. x 32 mm. x 6 mm., made of lead oxide and sulphuric acid, and placing them into a frame having a separate compartment for each piece, the space between each piece and the next being all round 4 mm. The process could be somewhat similar to biscuit making.

Inquiry No. 9139.—Wanted, the name and address of some manufacturer of a coffee mill run by water motor.

Inquiry No. 9140.—Wanted, manufacturers of disc records for gramaphones that use a sapphire point instead of a steel needle.

Inquiry No. 9141.—Wanted, a boat like a row-boat, worked by levers in place of oars, which by a series of pulleys attached operates a propeller, the steering device is managed with the feet.

Inquiry No. 9142.—Wanted, an appliance used in ice chests to make ice last longer.

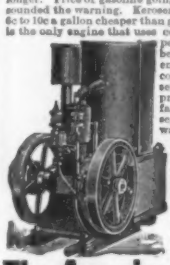
Locomotives, exhaust controlling device for, J. A. Richardson	954,998
Loom, G. A. Menendian	954,450
Loom let-off mechanism, A. E. Rhoades	954,648
Loom stop motion, H. W. Williams	955,030
Lubricator, C. J. Van Doren	954,900
Lunch box, A. Biro	954,918
Mail carrier, J. W. White	954,554
Mail crane, C. F. Morris	954,988
Mail receiving and delivering apparatus, F. Gardner	954,952
Mailing receptacles, exhibitor for, J. W. Cutler	954,786
Malting, J. Schnelbie	954,889
Manure loader, Sinner & Sims	954,545
Match scratching attachment, H. C. Joiner	954,738
Material cutter and grouping frame, H. Zimmerman	954,559
Material moving mechanism, J. N. Cox	954,784
Measuring device, J. R. Condon	954,782
Meat, packaging and preserving, L. Moore	954,535
Mechanical movement, electrothermal means for producing, A. A. Low et al	954,682
Metal clip, J. W. Shirer	955,003
Milking machine, L. M. Lundell	954,530
Milling tool, E. E. Wetzel	955,029
Mixing apparatus, centrifugal, A. Furowicz	954,951
Moistener, N. C. Shatzer	954,651
Mold, E. E. Orr	954,645
Mold, P. S. McKenzie	954,687
Molder's flask and match plate, J. S. Van Buren	955,021
Molding apparatus, S. Griffith	954,430
Motor. See Current motor.	
Motor reversing gear, automatic, B. Loutzky	954,867
Motor starter, electric, K. von Dreger	954,724
Motors, guide wheel for plow, E. M., E. F. and & D. O. Wheelock	954,839
Music chart, E. M. Hunter	954,436
Music leaf turner, J. F. McGuire	955,093
Nozzle holder, W. H. Titus	954,662
Nut lock, A. A. & J. F. Darby	955,054
Oil burner, E. N. Shaw	954,652
Oil burner, crude, A. J. Hennessey	954,959
Oil extracting apparatus, W. J. Wells	954,660
Oiling system for engines, G. W. Fairfield	955,062
Ore roaster, A. J. Garver	954,729
Ore solutions, apparatus for recovering values from, C. Robinson	954,466
Ores, concentration of, H. L. Suiman	955,012
Organ and piano, combined, W. R. Weaver	954,659
Oven turn table, M. D. Nicholson	955,095
Overload protective device, E. F. W. Alexanderson	954,845
Oyster carrier, M. S. Smith	954,769
Package filling machine, W. H. Doble	954,722
Packing, E. W. Snyder	954,655
Padlock, B. J. Grier	954,795
Padlock, J. Dembinski	954,856
Pan. See Baking pan.	
Paper box, D. L. Block	954,414
Paper holder, S. Wheeler	954,709

Try Kerosene Engine

30 Days Free

Gasoline Prices Rising.

You can't run a farm engine profitably on gasoline much longer. Price of gasoline going sky high. Oil Companies have sounded the warning. Kerosene is the future fuel and is now 6c to 10c a gallon cheaper than gasoline. The Amazing "Detroit" is the only engine that uses common lamp Kerosene (coal oil) perfectly. Runs on gasoline, too, better than any other. Basic patent. Only 3 moving parts. Comes complete ready to run. We will send a "Detroit" on free trial to prove all claims. Runs all kinds of farm machinery, pumps, saw rigs, separators, churns, feed grinders, washing machines, Silo fillers and electric lights. Money back and freight paid both ways if it does not meet every claim that we have made for it. Don't buy till you get our free catalog. 2 to 24 h. p. in stock. Prices "stripped," $29.50 up. Special demonstrator agency price on first outfit sold in each community. 7,000 satisfied users. We have a stock of testimonials. Write quick. (52)



The Amazing "DETROIT"

Detroit Engine Works, 127 Bellevue Ave., Detroit, Mich.

HEALTH MERRY GO ROUND MAKES HAPPY, HEALTHY CHILDREN

who prefer to stay at home and enjoy themselves rather than play on the streets. Operated by children themselves; the movements not unlike that of rowing, brings every muscle into play. Most healthful form of outdoor exercise; keeps lungs inflated, develops sturdy bodies, strong arms, straight backs, broad shoulders. Makes children studious. You owe the children this delightful pleasure—you'll save it in doctor bills. Inexpensive, simple, absolutely safe; no cogs or complicated gears to catch and tear clothing. **Not a toy, but a real Merry-Go-Round.** Will last for years. Full particulars and handsomely illustrated booklet free.

HEALTH MERRY-GO-ROUND CO., Dept. P QUINCY, ILL.

Aeroplanes and Motors

We are building monoplanes of the Blériot cross-channel type. Delivery 4 weeks after receipt of order. Flight guaranteed. Price $5,000; one-third cash with order.

We also build several kinds of light-weight aeronautic motors and propellers. Particulars and prices furnished upon application.

SCIENTIFIC AEROPLANE CO.
Box 773, New York

MAY OUTING

¶ The best all-round number of OUTING ever published.

¶ Beautiful color pictures of college sports. Whigham's COMMON SENSE OF GOLF. Wonderful game bird photographs. COMEDIANS OF THE DIAMOND, by Van Loan.

¶ TWO ON THE TRAIL breathes the spirit and romance of the wilderness. It's a bully story.

¶ All News-stands, 25 cents. $3.00 a year. Send fifty cents in stamps today for three months' trial subscription.

THE OUTING MAGAZINE
315 FIFTH AVENUE, NEW YORK CITY

Paper machines, suction roll for, W. H. Millspaugh, reissue	13,100
Paper pulp screen, O. Wandel	955,025
Paper rolls, machine for making toilet, H. Liebeck	954,527
Pavements and the like, tread surface for, C. B. Jacobs	954,906
Pen, fountain, C. W. Boman	954,415
Pen, fountain, P. J. Heimer	954,514
Pencil sharpener, H. W. Kohnes	954,812
Percolator, E. S. Peck	954,582
Piano, L. W. Norcross	955,096
Picture exhibiting device, Willoughby & Jacobson	954,555
Pile casings, fitting for, F. A. Koetitz	954,973
Pipe. See Culvert pipe.	
Pipe, G. Bradley	955,048
Pipe coupling, W. F. Drew	954,504
Pipe coupling, W. A. Turner	954,549
Pipe coupling, automatic train, O. C. Blair	955,045
Pipe crushing and shearing machine, F. I. Ellis	955,117
Pipe fitting, drainage, E. D. Tucker	955,109
Pipe joint, flexible, G. F. Barron	954,496
Pipes, rods, etc., coupling for, Harriman & Hendrickson	954,957
Planter, hand, M. M. Logan	954,576
Planter, potato, J. Hadie	954,860
Plastic material, producing objects from, Z. Olsson	954,991
Pliers, R. I. Metzger	954,818
Plow, E. E. Bradfield	955,047
Plow for steam cultivation, disk, R. H. Fowler et al.	954,950
Plow harrow attachment, wheeled, J. R. Naylor	954,758
Plow reversing mechanism, J. P. Field	954,567
Plow, traction gang, C. J. Johnson	954,969
Poke, animal, H. S. Watrous	954,551
Post anchor, J. Lauz	955,086
Power transmitting device, A. W. Whitcomb	954,661
Precious stones, setting for, V. A. Gebhardt	954,568
Press, A. G. Mead	954,449
Press, R. F. Haerry	954,625
Press bed, F. C. Leethem	955,087
Pressed-head, W. H. Fisher	955,063
Printing cylinders, plate locking device for, V. Fiiteau	954,506
Printing form for printing advertisements, J. S. Dittmar	954,721
Printing plates in grain manner, preparing, H. S. Aufermann	954,412
Printing, machine for making, J. S. Duncan	955,116
Printing press, H. R. Moore	954,683
Printing press, cutting stick for, S. Kaufman	954,679
Printing warps, machine for, A. C. Schoen	954,890
Projecting apparatus, Fiallo & Rojas	954,947
Propeller, A. von Parseval	954,992
Propeller, feathering blade, C. W. Van Winkle	955,023
Propeller, reversible, H. Pawlik	954,539
Propelling means, boat, W. Cutler	954,718
Pulp agitator, R. W. Gordon	954,511
Pulp, apparatus for forming receptacles from, C. F. Homburg	954,962
Pulp extractor, W. H. Janney	955,077
Pump, F. Schmidt	954,471
Pump, H. P. Petersen	954,994
Pump, detachable, G. W. Kellogg	954,864
Push switch, J. G. Peterson	954,461
Push switch, C. E. Anderson	955,035
Rack or cabinet, E. H. Hitchcock	954,805
Radiator, J. Kane	954,971
Rail fastener, G. Porter	954,465
Rail joint, C. L. Bundy	954,419
Rail joint, H. F. Roach	954,590, 954,649
Rail joint, R. G. Musgrove	954,684
Rail joint, G. W. Klinker	954,865
Rail joint, J. F. Wessel	955,028
Rail mounting, guard, L. R. Bishop	954,919
Rail support and brace, P. Poirier	954,585
Rake. See Hay rake.	
Rake and hoe, combined, J. Dalpay	954,616
Ratchet mechanism, G. O. Leopold	954,980
Razor, safety, J. Molkenthin, Jr.	954,871
Refrigerator, J. R. Wood	954,906
Resistant surface and making the same, C. B. Jacobs	954,965
Respirator, intravaginal infantile, W. E. Kelly	954,519
Rock drill, G. W. Smith	954,706
Rock drill, Selleck & Sharp	954,826
Rolling mill for producing tubes, M. Peters	954,880
Roof, W. E. Polhemus	954,995
Rope making machine, T. M. McIntosh	954,686
Rotary engine, E. A. Bohm	954,609
Rotary engine, C. E. Waldron	954,832
Rotary steam joint, J. Nuttall	955,097
Roundabout, A. C. Tulene	954,482
Rubber stamp rack, Z. D. Graham	954,793
Rural free delivery boxes, support for, O. W. Randall	954,588
Saddle, harness, W. E. Pitt	955,102
Saponaceous compound, E. Weiss	954,486
Sash lock, E. O. Daniels	954,617
Sash lock, H. A. Bennett	954,915
Sash lock and antirattler, J. & A. J. De Mars	954,719
Sawmill feed mechanism, A. A. De Louch	955,057
Scaffold, hanging, E. Stranden	955,011
Scraper, J. D. Vasey	954,901
Scraper, block, G. C. Bemis	954,497
Screen. See Paper pulp screen.	
Screen attachment, G. P. & P. D. Burke	954,420
Screen plate fastener, M. J. Mollen	954,452
Scrubbing device, Raymond & Baker	954,541
Seal, bottle and jar, Steininger & Walrath	954,897
Seal, dating nail, E. J. Brooks	954,924
Seal lock, G. H. Barker	954,910
Sealing device, carton, W. S. Scales	954,704
Seat and walking stick, combined, W. Schoke	954,473
Service box, extension, F. M. Jacob	954,437
Sewing machine, C. M. Larsen	954,443
Sewing machine, W. T. Auckram	954,847
Sewing machine attachment, M. McCabe	954,756
Sewing machine cloth presser, D. Noble	954,990
Sewing machine presser foot, J. S. Johnston	954,970
Sewing machine tension releasing device, W. C. Free	954,858
Sewing machine trimming mechanism, J. P. Weis	954,553
Sewing machine work guide, Weis & Robbins	954,552
Shade bracket, window, F. H. Knapp	954,742
Shafts, making crank, W. I. Brock	954,923
Shafts, means for retaining roller bearing sleeves on, C. S. Lockwood	955,120
Sheet feeding machines, pile elevator for, B. Gustafson	954,732
Sheet metal folding machine, R. T. Withers	954,556
Sheet or card lifter, C. L. Burdick	954,927
Sheet registering, automatic, H. A. W. Wood	954,603
Sheep shearing machine, D. Lennox	954,681
Shingle machine, W. S. Hiett	954,803
Shingle, metallic, J. Gruber	954,790
Ships, apparatus for indicating the speed of, R. Star	955,008
Ship's course indicator, C. S. Burgon	954,777
Shock absorber, R. Lipman	954,526
Shoe holder, L. Sonntag	954,828
Shoe polishing stand, A. Hoffman	955,069
Shuttle, Le Doux & Ryon	955,119
Side delivery rake, swath turner, etc., W. E. Martin	954,534
Signal device, automatic, F. Porto	954,586
Signal system, electric, A. L. Sohm	954,656
Skate, roller, J. W. Peters	954,993
Skate, roller, S. E. Astbury	955,037
Skiving machine, J. Busfield	954,778
Slime separator, centrifugal, J. T. Lindahl	954,528
Sound transmitting instruments, receiver for, J. J. Comer	954,931
Spark gap apparatus, W. Peukert	955,101
Spark plug, H. F. Provandie	954,697
Speed indicator, L. A. Kaiser	955,081
Speed recording mechanism, L. L. Bloch	954,921
Spigot, measuring, W. J. Hughes	954,435
Spinning frames, automatic doffer for fly, N. R. Newsholme	954,688
Spinning machines, waste cleaner for ring, R. Koref	954,975
Spring motor, C. H. Von Hohenstein	954,602
Spring wheel, P. M. Kling	954,522, 954,523
Sprocket wheel, J. M. Dodge	954,939, 954,940, 954,941
Square and rule, combination, C. H. Peterson	954,460
Stair tread, C. B. Jacobs	954,907
Stairway structure, W. B. Simpson	954,893
Steam superheating apparatus, H. Cruse	954,501

THE
THRALL
REFINED
MOTOR

Makes This the Fastest Boat of Same Size and Power in the World →

Let us send you the proof. But speed is not the only advantage of owning a Thrall Refined. You also get the ***simplest, most durable, most economical*** motor. Only 4 moving parts; all bearings bronze bushed and interchangeable. As to

Endurance—310 Miles in 25 Hrs. 10 Min.

is the record of the Thrall. Any man, woman, boy or girl can run a Thrall Motor. 5,000 satisfied customers. Equipped with our own special float feed carburetor. The famous single cylinder 3 H. P. Refined

Weighs Only 60 Pounds

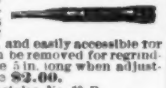
Equal to other 4 or 5 H.P. motors. If you want a light, simple motor, with plenty of power, endurance and strength—Get the Thrall. Other sizes up to 12 H. P., single and multiple cylinders. Especially designed for speed and service.

Write for the Proof Let us send letters, facts and figures. Also our beautiful catalog, written in simple way so anybody can understand it. Address now.

THRALL MOTOR CO.
6-34 Twenty-first St., Detroit, Mich.

Spencerian
STEEL PENS
are made of accurately tempered steel. Smooth, non-scratching, elastic, easy writers. There's one to suit you. Sample card, 12 different, for 6 cts. postage.
SPENCERIAN PEN CO., 349 Broadway, N. Y.

NO HAMMER NEEDED
with our Automatic Adjustable-Stroke Center Punch. Has knurled adjustable screw cap, which regulates stroke. Accurate and quick work done without a hammer in either light or heavy strokes. Working parts are hardened, durable, and easily accessible for necessary repairs. Point can be removed for regrinding and easily replaced. Size 5 in. long when adjusted for medium stroke. Price $2.00.



Send for 232 page catalog No. 18-B.
THE L. S. STARRETT CO., Athol, Mass., U. S. A.

LABOR SAVING DEVCES FOR OFFICE WORK.—Labor Saving Devices will be exhibitedat the Treasury Department, Washington, D. C., during the week beginning May 2, 1910. Requests for information and applications for entry stating the amount of space desired at this exhibit should be filed with the Secretary of the Treasury on or before April 20, 1910. Exhibits must be in place not later than 4:30 p. m., Friday, April 29, 1910. Electric current (110 or 220 volts direct) will be furnished.

WANTED.—Two third-class sub-inspectors (electrical) at $3.06 per diem. A competitive examination will be held April 28, 1910, for the purpose of filling the above positions. For further information address, "Commandant, Navy Yard, Brooklyn, N. Y."

THE BEST EQUIPPED SHOP
For Mechanical and Electrical Manufacturing
Special Machinery, Jigs, Tools, Repairs, Experimental Devices
Designing and Commercializing a Specialty
THE ROWLAND TELEGRAPHIC COMPANY, Baltimore, Md.

RUBBER STAMP MAKING.—THIS article describes a simple method of making rubber stamps with inexpensive apparatus. A thoroughly practical article written by an amateur who has had experience in rubber stamp making. One illustration. Contained in SUPPLEMENT 1110. Price 10 cents. For sale by Munn & Co., Inc. and all newsdealers.

ICE MACHINES Corliss Engines, Brewers and Bottlers' Machinery. THE VILTER MFG. CO., 899 Clinton St., Milwaukee, Wis

MODELS & EXPERIMENTAL WORK. Inventions developed. Special Machinery. E. V. BAILLARD CO., 24 Frankfort Street, New York.

CONSULTING ENGINEER.
ERNEST L. RANSOME
Reinforced Concrete
11 Broadway, New York

RUBBER Expert Manufacturers Fine Jobbing Work
PARKER, STEARNS & CO., 288-290 Sheffield Av., B'klyn, N. Y.

SOUTHERN STAMPING & MFG. CO.
Manufacturers of special and patented articles.
R. S., Nashville, Tenn.

Manufacturer of **Patented Articles, Models, Tools, Dies,** Jigs, Special Machinery, Experimental Devices, Novelties, etc.
CHAS. E. DRESSLER, 882-890 2d Ave., New York

HOEFT & COMPANY
Die Makers, Model Makers, Machinery Builders, Punch Presses
Light and Heavy Stampings. 141 Michigan St., Chicago, Ill., U.S.A.

DRYING MACHINES For Granular Material
S. E. WORRELL
Hannibal, Mo., U. S. A.

NOVELTIES & PATENTED ARTICLES
MANUFACTURED BY CONTRACT: PUNCHING DIES, SPECIAL MACHINERY.
E. KONIGSLOW STAMPING & TOOL WORKS, CLEVELAND, O.

PATENT NOVELTIES, dies and experimental work made by Louis L. Loeb, S. W. cor. Park Ave. and 131st St., New York. Correspondence solicited.

The Ball Transmission FOR Automobiles & Motor Boats
NEW YORK GEAR WORKS,
56 GREENPOINT AVE., BROOKLYN, N. Y.

Steering attachment, safety, H. P. Larouette	954,979
Stencil machine, C. L. Burdick	954,926
Stoker, mechanical, J. A. Caldwell	954,717
Stool, motorman's, W. E. Fawcett	954,857
Stopper tie, W. S. Dow	954,503
Store front construction, F. J. Flynn	955,103
Store service track, E. J. Brandt	954,611
Stove and stand, vapor, Savage & Gutermann	954,703
Stove, gas, A. C. Witman	954,557
Stove, heating, A. C. Klopping	954,741
Stove, oil, F. Conrath	954,422
Stud, collar, P. Eppelein	954,505
Studding, metal, H. E. White	955,111
Superheater, J. E. Bell	954,913
Superheater boiler, J. E. Bell	954,914
Supply and overflow fixture, combination, W. S. Graham	954,731
Swingletree hook, J. B. Johnson	954,573
Switch handle, electric, J. G. Peterson	954,463
Switch throwing and locking device, A. A. Stock	954,548
Table. See Billiard table.	
Talking machine attachment, W. S. Mc Namara	954,455
Talking machine sound box, R. L. Gibson	954,953
Tank, J. O. Bewan	954,916
Tanks, liquid gage for pressure, A. Verhoeven	954,550
Target, recording, J. W. Rice	954,997
Target trap carrier, H. C. Peffer	954,583
Tea or coffee pot, G. E. Curtiss	954,502
Telegraph, printing, J. E. Wright	954,489
Telegraphy, apparatus for wireless, G. Marconi	954,640
Telegraphy, wireless, G. Marconi	954,641
Telephone and fire alarm or kindred service system, combined, W. W. Dean	955,056
Telephone and telegraph system, combined, G. E. Hines	954,734
Telephone, automatic, J. E. Rogers	954,701
Telephone, direction plate, B. S. Whitehead	954,770
Telephone microphone, V. Tardieu	954,829
Telephone system, O. M. Leich	954,445
Telephones, sterilizing and muffling shield for, F. M. Allen	954,909
Tenoning and pointing machine, F. C. Miller	954,985
Thermometer dial, C. H. Myers	955,091
Thread holder, bobbin, E. G. Cone	954,562
Threshing machine feeder, C. Barnhart	955,042
Threshing machine feeder, H. J. Boyer	955,046
Tie plate, W. McKee	954,538
Tilling machine steering gear, G. Spalding	955,107
Tire chain, elastic non-skidding, Abrams & Mason	954,844
Tire heater, D. L. Brown	954,612
Tire protector, A. E. Goldman	954,730
Tire, wheel, G. W. Crawford	955,053
Tires, demountable rim for automobile, W. N. Booth	954,416
Tool hanger, O. Rumo	954,765
Tools, attachment for repair, W. L. Dinsmoor	954,424
Torpedoes, turbine drive of gyroscopic steering gears of, A. E. Jones	954,634
Toy, Starmer & Tapio	955,006
Trace holder, H. G. Weatherill	955,020
Train stop, automatic, R. D. Jarvis	954,517
Train stop, automatic, S. M. Duncan	955,059
Transfer mechanism, D. F. Crawford	954,500
Transmission mechanism, J. M. Mack	954,531
Traveling bag or luggage carrier, C. Wiedemann	954,840
Trimming machine, rotary, L. Muther	954,578
Trolley poles, automatic safety device for, M. M. Zellers	954,907
Trousers and other garments, supporting band for, C. A. Blake	954,849
Trunk and suit case lock, Crim & Loy	954,854
Tube. See Draft tube.	
Turbine engine, W. Fennell	954,946
Turnstile registering device, J. E. Allison	954,846
Typewriter, J. W. Paul	954,581
Typewriter attachment, O. V. Schauer	954,470
Typewriting machine, O. C. Earle	954,439
Typewriting machine, A. G. F. Kurowski	954,637
Typewriting machine, O. Woodward	954,843
Typewriting machine, C. E. Smith	954,894
Typewriting machine, W. E. Barnard	954,911
Typewriting machine, E. E. Barney	954,912
Typewriting machine, H. H. Steele	955,010
Urinals, etc., ventilating fitting for, J. M. Young	954,558
Vacuum cleaning apparatus, H. E. Fanshawe	954,726, 955,118
Valve, J. D. Twiggs, Jr.	955,018
Valve, Barr & Wainwright	955,043
Valve for radiators, air and water discharge, F. W. Leuthesser	954,815
Valve handle, W. P. Marble	954,533
Valve, water, Anthony & Morris	955,036
Valve, water gate, A. J. Collar	954,930
Valves, operating means for gate, D. Libby, Jr.	954,446
Vapor burners, automatic cut-off for, S. Stenberg	954,477
Varnish, L. H. Backeland	954,666
Vaults, construction of vestibules of armor-plate, G. L. Damon	954,670
Vegetable topper, B. L. Ufford	955,019
Vehicle brake, W. J. Wilde	954,711
Vehicle top rest, P. Henry	954,571
Vending apparatus, ticket, G. F. Day	954,787
Vending machine, J. F. Moulton	954,873
Vending machine, stamp, S. L. Long	954,816
Vending machine, stamp and ticket, E. E. Wigzell	955,032
Ventilator. See Car ventilator.	
Vessel, marine, C. L. Burger	954,713
Violin, J. E. L. Winecoff	954,487
Vise, A. W. Richards	954,696
Vise and support, Higham & Shakespeare	954,961
Voting machine locking mechanism, C. C. Abbott	954,771
Wagon and auto brake, W. G. Aldridge	955,034
Wall forming device, W. A. Kurman	954,636
Warp uniting mechanism, Hansen & Petersen	954,862
Warps, spacing device for, J. G. Gourdeau	954,512
Washboard, J. W. Gribbin	954,429
Washing machine, D. Hawley	954,802
Water closet cistern, R. E. Crane	954,934
Water current power system, C. F. A. Roell	954,999
Water meters, stuffing box for, E. E. Gamon	954,621
Water motor, J. H. Hendrickson	954,433
Weather strip, J. P. Stahl	954,896
Web feeding and cutting attachment, Mann & Oungst	954,817
Web feeding mechanism, M. H. Mann	954,751
Wedge, attaching, J. L. Clarke	954,669
Weevil exterminator, boll, P. E. Hebert	954,629
Wells, working barrel for oil, Walker & McDevitt	955,024
Wheel. See Spring wheel.	
Whiffletree hook, C. E. Jones	954,810
Windmill coupling, safety key, E. C. Danker	954,671
Window construction, J. Z. H. Bager	954,666
Window lock, A. Lewandowski	954,638
Window lock, W. R. Scurlock	954,892
Window operating device, S. E. Cibulas	954,851
Window pane fastener, J. W. Van Newkirk	954,484
Window, reversible, N. Poulson	954,587
Window, reversible, G. F. Lindgren	954,746
Wire drawing machinery, continuous, H. Saville	954,888
Wire fabric, H. E. White	955,110
Wire hoops, lock forming device for, J. Rolston	954,886
Wire plating machine, G. L. Wallace	954,833
Wood bending machine, H. W. Bason	954,848
Wool washer, F. L. Furbush	954,728
Wrench, J. B. Irwin	954,964
Wrench, W. O. & J. C. Singer	955,004
Yarn moistening apparatus, P. Schilde	955,001

A printed copy of the specification and drawing of any patent in the foregoing list, or any patent in print issued since 1863, will be furnished from this office for 10 cents, provided the name and number of the patent desired and the date be given. Address Munn & Co., Inc., 361 Broadway, New York.

Canadian patents may now be obtained by the inventors for any of the inventions named in the foregoing list. For terms and further particulars address Munn & Co., Inc., 361 Broadway, New York.

"We Believe Honesty is the ONLY Policy"

FISK
Quality **TIRES**

WE SHOULD LIKE TO HAVE A HEART-TO-HEART TALK with every user of automobile tires, because no fair-minded thinking person could hear our story without becoming convinced that the claims made for our products are **honest** claims, that Fisk *Quality* Tires and the Fisk Removable Rim stand for all that is Best in this equipment so vital to the motorist.

OUR STORY IS A SIMPLE ONE. WE ARE HONEST WITH THE PUBLIC, **honest** from the time we first purchase our rubber and fabric; **honest** when our workmen begin to shape them into tubes and casings; **honest** in our testing and inspection through each individual stage of manufacture; **honest** in placing our tires in the hands of users by providing for distribution through our own branches and reputable dealers; **honest** in making fair adjustments when some tires, in spite of rigid inspection, show defects when put to actual road use.

We Have Proven That HONESTY Is The ONLY Policy On Which The Manufacture Of Tires Can Be Successfully Conducted To The Satisfaction Of Maker And Consumer.

NEW LITERATURE ON FISK *QUALITY* TIRES TO FIT ALL RIMS

THE FISK RUBBER CO., Dept. U, Chicopee Falls, Mass.
Branches in Seventeen Cities

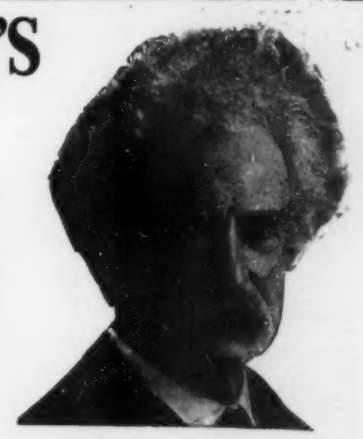
WELL DRILLING MACHINES
Over 70 sizes and styles, for drilling either deep or shallow wells in any kind of soil or rock. Mounted on wheels or on sills. With engines or horse powers. Strong, simple and durable. Any mechanic can operate them easily. Send for catalog.
WILLIAMS BROS., Ithaca, N. Y.

DURYEA BUGGYAUT
"In a class by itself."
"Superior to all others."
"A most wonderful car."
CHAS. S. DURYEA, Reading, Pa.

Rider Agents Wanted
in each town to ride and exhibit sample 1910 bicycle. *Write for Special Offer.*

Finest Guaranteed 1910 Models $10 to $27
with Coaster-Brakes and Puncture-Proof tires.
1908 & 1909 Models $7 to $12
all of best makes
100 Second-Hand Wheels *All makes and models,* **$3 to $8**
good as new
Great FACTORY CLEARING SALE
We ***Ship on Approval*** *without a cent deposit, pay the freight* and allow
TEN DAYS FREE TRIAL. We
TIRES, coaster brake rear wheels, lamps, sundries, *half usual prices.* Do not buy till you get our catalogs and offer. *Write now.*
MEAD CYCLE CO., Dept. P. 215 Chicago

MARK TWAIN'S WORKS
at ONE-HALF former price



It has been Mark Twain's ambition to have his books in every American home, and he has made a great personal sacrifice, which brings about this remarkable situation—for the first time in the history of publishing, copyrighted books are sold at the price of non-copyrighted books.

AUTHOR'S NATIONAL EDITION
25 Beautiful Volumes

Mark Twain is the youngest man of his day. All his books are imbued with his spirit—they are new books; to ***own*** them is always to have new books, a fountain of youth. They never age because humor, kindliness, and truth never grow old. They are books for young people of all ages.

Special Features of this Edition

Mark Twain himself has written a preface to the edition. Brander Matthews has written the biographical criticism of Mark Twain and his work. There are portraits of the author from photographs and paintings taken at periods when the different books were in process of writing. This edition includes his later collected writings such as "A Dog's Tale," "Eve's Diary," etc.

There are beautiful pictures by such artists as BROWN, FROST, NEWELL, BEARD, DIELMAN, SMEDLEY, THULSTRUP, CLINEDINST, MORA, WELDON, KEMBLE, GILBERT, DU MOND, MERRILL, OPPER.

The binding is a beautiful dark-red vellum book cloth, with blue title labels stamped in gold. The books are printed on white antique wove paper, especially made for this edition.

The size of each volume is 5x7½ inches.

HARPER & BROTHERS

HARPER & BROTHERS
Franklin Square
New York City

Please send me for examination, carriage free, a set of **MARK TWAIN'S WORKS, Author's National Edition,** twenty-five volumes, cloth binding. It is understood I may retain the set for five days, and at the expiration of that time, if I do not care for the books, I will return them at your expense. If I keep the books, I will remit $2.00 a month until the full price, $25.00 has been paid.
S. A. 4.

Signature.....

Send books to .....

Flies Will Soon Be Flying

It's time to think about your screens. Take them out—look them over.

RUSTED—"BUSTED" SPOILED?—TOO BAD

Draw a lesson from the rusted screens and renew with

Pompeiian Bronze Screen Cloth

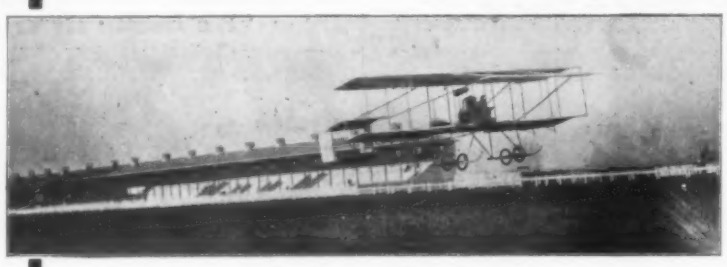
It cannot rust. Will last as long as your house. Salt air has no effect upon it.

Weather-Proof—Climate-Proof Rust-Proof and Wear-Proof

Over 90% pure copper. Lets in the largest amount of air because the meshes are not all choked up with paint. The color of *Pompeiian Bronze Screening* is permanent, because it's the natural bronze color. It's the economical screening.

Ask your dealer for *Pompeiian Bronze*. Specify and insist on it for all the screens you order. All sizes of mesh, all weights. Most Hardware Dealers have it. If yours hasn't, don't take any other. Write our nearest branch. We'll supply you direct and guarantee a satisfactory purchase.

CLINTON WIRE CLOTH COMPANY
Factory, CLINTON, MASS.
Boston New York Chicago San Francisco



Roger Sommer in Flight—Doncaster

Precision–Not Approximation

That's the feature of the Warner Auto-Meter.

At any speed—

Under any conditions of service—

It tells you, with absolute accuracy, how fast and how far you've gone.

It enables you to ***know***—not ***guess***—your tire, fuel and lubrication cost per mile.

That's why you will find the Warner Auto-Meter the only speed indicator considered in all important races or tests, for absolute accuracy is demanded in these.

The Warner Auto-Meter costs more, and the experienced motorist knows—out of his experience—that it is worth more.

Send or call for our interesting free booklet on speed indicators and their uses.

Warner Instrument Co.
Main Offices and Factory, 871 Wheeler Avenue, Beloit, Wis.

The Warner Auto-Meter

BRANCHES: Atlanta, 102 Edgewood Ave.; Boston, 925 Boylston St.; Buffalo, 730 Main St.; Chicago, 3490 Michigan Ave.; Cincinnati, 807 Main St.; Cleveland, 3062 Euclid Ave.; Denver, 1518 Broadway; Detroit, 870 Woodward Ave.; Indianapolis, 330-331 N. Illinois St.; Kansas City, 1613 Grand Ave.; Los Angeles, 743 S. Olive St.; New York, 1909 Broadway; Philadelphia, 201 N. Broad St.; Pittsburg, 5940 Kirkwood St.; San Francisco, 26-28 Van Ness Ave.; Seattle, 611 E. Pike St.; St. Louis, 3923 Olive St. [53]

CARBORUNDUM

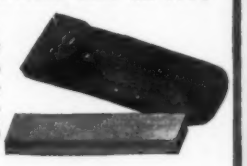
A better, keener edge in less time, on any edged tool, if you use

CARBORUNDUM SHARPENING STONES

Made in every size and grit for every sharpening requirement

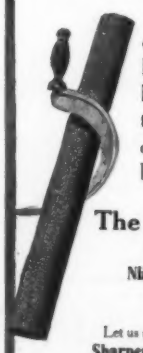
Ask your hardware dealer or send direct—

Sportsmen's Pocket Stone No. 114-F



Indispensible to the man who fishes or hunts—by mail 75 cents.

Niagara Scythe Stone No. 191-F



Does away with use of the grindstone—keeps scythe and grass hook in perfect condition—Outlasts several ordinary scythe stones—by mail 25 cents.

The Carborundum Company
Niagara Falls, N. Y.

Let us send you the **Sharpening Stone Booklet**

Earn $75 to $250 Per Mo.

AS AN EXPERT AUTOMOBILE CHAUFFEUR AND MECHANICIAN

You can qualify IN EIGHT WEEKS. Position awaiting you. Full scholarship $85.

This is the largest Automobile College west of N. Y.: 12 instructors. Private garage. Training practical—not theoretical. Full particulars and handsome prospectus on request.

SOUTHWEST AUTO COLLEGE
1409 E. John St., Kansas City, Mo.

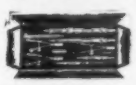
ALOE—For Sixty Years the Standard of the World for Quality. Established 1850—ALOE

Civil Engineering and Surveying Instruments

DRAWING MATERIALS AND SUPPLIES

BLUE PRINT PAPER, TRACING CLOTH, ETC.

"FREE" Write for Catalogue. Sent "FREE"



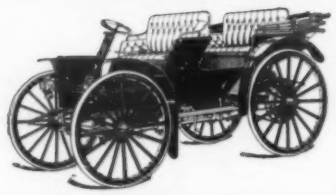
A. S. ALOE CO., 507 Olive Street, St. Louis, Mo.

100 Superb Views of New York, in album 7½ x 10 inches; handsome cover. Send 30c in U. S. coin or stamps to **GEO. P. HALL & SON, 212 Broadway, New York**
Special Edition (limited) at $1.00 each

Papers Held Firmly Together
SECURITY—
To hold papers so that not one can slip out:
"TWIN GRIP"
Paper Fastener
Get free samples and prove it. Write
The DeLong Hook & Eye Co.
Philadelphia

I H C Auto Buggies

Ideal For Business and Pleasure



YOU will find the I H C Auto Buggy the ideal vehicle for your use. It is the most simple car to operate, can be used by your family with perfect safety—and when you want to make a hurried trip anywhere it is always ready.

With an I H C Auto Buggy you can travel from one to twenty miles an hour over hills, through mud, snow—over any roads.

When you buy get the car that has proved to be most

SIMPLE—ECONOMICAL—DURABLE

Decide on one with the High Wheels and Solid Tires. You will find the I H C Auto Buggy the easiest riding and you will never have "tire troubles." The large wheels roll over bumps and ruts while small wheels jump over them. With solid tires you are never delayed by punctures or blow-outs, and you save many dollars through not having to repair and replace wornout tires.

There are many other advantages of I H C Buggies that you ought to know about. They have full elliptic springs (36 inches long by 1⅛ inches wide) and a long base, insuring easy riding qualities.

Ask the Interational dealer to tell you all the facts about the I H C Auto Buggies, or if you prefer write direct to us for further information.

INTERNATIONAL HARVESTER COMPANY OF AMERICA Chicago U S A
(Incorporated)

THE I-H-C LINE

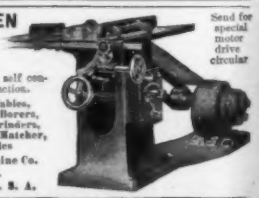
LOOK FOR THE I. H. C. TRADE-MARK. IT IS A SEAL OF EXCELLENCE AND A GUARANTEE OF QUALITY

LUFKIN TAPES AND RULES
ARE THE BEST.
For sale everywhere. Send for Catalog No. 16.
LUFKIN RULE CO.
Saginaw, Mich., U. S. A.
New York and London.

LEARN TO BE A WATCHMAKER

Bradley Polytechnic Institute
Horological Department
Peoria, Illinois
Formerly Parsons Horological Inst.
Largest and Best Watch School in America
We teach Watch Work, Jewelry, Engraving, Clock Work, Optics. Tuition reasonable. Board and rooms near school at moderate rates. Send for Catalog of Information.

MOTOR DRIVEN CRESCENT MACHINES



Send for special motor drive circular

are neat, substantial, self contained, and give satisfaction.

Band Saws, Saw Tables, Jointers, Shapers, Borers, Swing Saws, Disk Grinders, Planers, Planer and Matcher, Band Saw Blades

The Crescent Machine Co.
220 Main St.
Leetonia, Ohio, U. S. A.

BOOKLET MAILED FREE

24 pages practical advice. Will save time, trouble and material. Write now.

Burroughs Wellcome & Co. 46, LAFAYETTE STREET, N.Y. CITY 60 to 62, CRAIGTON BLDG., MONTREAL

MAKE YOUR BICYCLE INTO A MOTORCYCLE

At small cost by attaching the ERIE Attachment which includes all parts so that any one can make a strong machine that will climb steep hills and run for 1½c. a mile. Send 2c. stamp for Catalog S and special price.

Motorcycle Equipment Co., Hammondsport, N.Y.

Incorporate

Your PATENTS and BUSINESS in ARIZONA

Laws the most liberal. Expense the least. Hold meetings, transact business anywhere. Blanks, By-Laws and forms for making stock full-paid for cash, property or services, free. President Stoddard, FORMER SECRETARY OF ARIZONA, resident agent for many thousand companies. References: Any bank in Arizona

STODDARD INCORPORATING COMPANY, Box 8000
PHOENIX, ARIZONA

POLAR WATER STILLS
ALL CAPACITIES

For Colleges, Clubs, Hospitals, Hotels, Laboratories, factories, bottlers or the home; wherever chemically-pure and palatable water is essential or desired.

Automatic, economical and dependable apparatus.

Send for Bulletin

POLAR ICE MACHINE COMPANY
83 Jackson Boulevard, Chicago

HELMET OIL LUBRICATES ANYTHING SEND FOR SAMPLE FREE
C. H. BESLY & CO. 95-91 S. CLINTON ST. CHICAGO, U.S.A.